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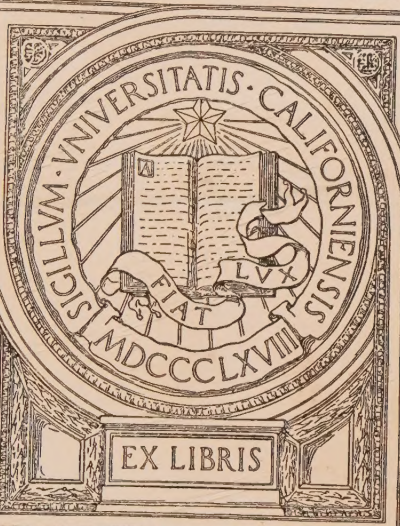

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A

DIABETIC MANUAL

FOR THE

MUTUAL USE OF DOCTOR AND PATIENT

BY

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TO
HELP MAKE THE HOME
SAFE FOR THE
DIABETIC
IS THE OBJECT OF
THIS BOOK.

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PREFACE TO THE THIRD EDITION.

THE education of the diabetic was the experiment attempted in the first edition of the Manual, but today it is recognized as a necessity.

In the second edition the prevention of diabetes was suggested, because of the preponderance of the disease in the fat. Statistics and the restriction of food, incident to the Great War, have proved the soundness of this doctrine, and now we know that diabetes is many times as common in the obese. Temperance in food as well as in alcohol means added years of healthy life.

An early diagnosis of a disease implies a mild course and successful treatment, and this is one of the objectives of the present edition. The detection of most diseases is complicated and dependent upon the doctor; the detection of diabetes is simple and can be made by the patient. Louisa Drumm, when seventy-nine years of age, discovered diabetes in a boy in her boarding house. In similar fashion it is possible for the reader to protect parent and grandparent, brother or sister, husband or wife, son or daughter, by the use of the Benedict test on each birthday.

What diet and insulin can accomplish, when once the diagnosis is made, can be learned from the physician and to some extent from the pages of this book.

ELLIOTT P. JOSLIN.

BOSTON, 1924.

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DIABETIC MANUAL.

CHAPTER I.

DIABETES.

The Diabetic Club of America and the Rules of Admission.—There are a million members more or less of the Diabetic Club of America today and the majority have joined the Club because they have been fat. Only 10 per cent have been admitted who were underweight, and so exclusive is the Club for those above the age of fifty that only 1 thin applicant has been enrolled for 20 who weighed above the normal average.

Should one regard diabetes as a penalty of obesity, the greater the obesity the more likely is nature to enforce it. A fat man generally has a fat wife, so it is not uncommon to encounter the disease in both heads of the family. Fat parents have fat children, so it is no wonder that diabetes is hereditary in almost 20 per cent of the cases. Obesity is so common in the Hebrew race that it is easy to understand why diabetes is two and a half times as frequent in the Jewish population of Boston as in the rest of the community. Lack of exercise is, of course, a factor in producing the condition of overweight and thus is an indirect cause of diabetes. Disuse of the muscles, however, is also a direct factor, for it is largely in the muscles that the sugar formed from the food is consumed. The man who gives up an active outdoor life and is promoted to an office chair by this change becomes a promising candidate for diabetes.

No other condition rivals obesity in importance as a fore-

runner of diabetes, but a strenuous, mental life is probably of some significance. This appears reasonable for it has been shown that medical students, after three-hour written examinations upon which their promotion for a year depends, often show sugar in the urine temporarily, and it may not be a chance coincidence that numerous children have been under my care for diabetes who had recently led their respective classes at school. An illustration of this tendency is Case No. 1380, a child who came to my office showing 6.2 per cent of sugar. She had skipped two classes at school, and the following summer had eaten even more than her habitually large amount of sweets and candy.

In the presence of an infectious disease, for example tonsillitis, an existing diabetes grows worse; but it is yet to be demonstrated that diabetes frequently occurs as the result of an infection, save in the region of the pancreas and gall-bladder. A history of gall stones not infrequently precedes that of diabetes, which with such an origin is often benign.

Hereditary cases are usually mild. With the avoidance of obesity and with moderation in the use of sweet food the children of diabetics may be no more liable to the disease than other children. Particularly should the urines of such individuals be carefully examined when conditions arise which would favor the development of diabetes.

The Advantages of Diabetes Over Other Chronic Diseases.—It is perfectly true that diabetes is a chronic disease, but, unlike rheumatism and cancer, it is painless; unlike tuberculosis, it is clean and not contagious; and in contrast to many diseases of the skin, it is not unsightly. Moreover, it is susceptible to treatment, and the downward course of a patient can be promptly checked. Treatment, however, is by diet as well as by insulin and the patients who know the most, conditions being equal, can live the longest. There is no disease in which an understanding by the patient of the methods of treatment avails as much. Brains count. But knowledge alone will not save the diabetic. This is a disease which tests the character of the patient, and for success in withstanding it, in addition to wisdom, he must possess honesty, self-control and courage. These qualities are as

essential with as without insulin. Many of my patients have actually lived longer than would have been expected of them had they been normal, healthy people, and far longer than their similar fat friends whose obesity led to their death by way of the heart or kidneys. For the diabetic this is a demonstration and a challenge.

The Pancreas and Its Islands of Langerhans.—The underlying cause of diabetes is usually considered to be a derangement in one of the functions of the pancreas. This is a gland, in animals known as the sweetbread, which lies behind the stomach near the liver. It discharges into the bowel the most important digestive juice of any gland in the body, and this juice is capable of digesting all kinds of food. The digestive action of the pancreas is somewhat disturbed in diabetes, but the chief fault with the pancreas in diabetes lies in that function of the gland which regulates the body's use of the sugar formed from the food. This function appears to reside in groups of cells distributed throughout the pancreas and called the "islands of Langerhans." When these cells have been found to be diseased, usually a history of diabetes has been demonstrable. These groups of cells manufacture a special internal secretion, named insulin, which is discharged into the blood. Experimentally, with animals, it is easy to produce diabetes by simply removing a large portion of the pancreas, and the severity of the diabetes so produced is proportional to the amount of the gland removed. If the diabetic patient could secure a new pancreatic gland he would be cured.

Until the wonderful discovery of insulin by Dr. F. G. Banting and Mr. C. H. Best, two young men working in the laboratory of Professor Macleod, in Toronto, in 1921, all attempts to treat diabetes successfully by feeding patients the healthy pancreatic glands of animals, by the use of extracts made from the gland or by grafting portions of a healthy gland under the skin failed. In Chapter III an account of the investigations which led to the discovery of insulin and a description of it will be found.

Definition of Diabetes.—The disease sugar diabetes, usually known by its Latin name, "diabetes mellitus," is revealed

when sugar is found in the urine. A more complete definition would be: Diabetes is a disease in which the secretion of the islands of Langerhans is deficient and, as a result, the normal utilization of carbohydrate is impaired and sugar (glucose) is excreted in the urine. The development of the disease may be gradual or acute and with or without symptoms. It is fortunate that the disease can be so readily discovered, for unlike many diseases whose beginnings can be detected only by specialists or disclosed by the help of elaborate and expensive methods, such as the Roentgen-rays, diabetes can be easily and promptly recognized by any physician who will be on the watch for it and will examine the urine of his patient for sugar. The subsequent behavior of the disease and the effect of treatment are also readily regulated by simple urinary examinations; herein the diabetic has a great advantage over many another patient.

Source of Urinary Sugar.—The sugar in the urine of diabetic patients is derived from their food, and chiefly from that consumed within the preceding twenty-four hours. The effects of a meal begin to show within ten minutes by an increase of sugar in the blood and by the appearance of sugar in the urine. Most of the sugar in the urine comes from carbohydrate (sugar and starch), but in extremely severe cases as much as 58 per cent of the protein (examples of which are lean of meat and fish, white of egg, and curd of milk) and 10 per cent of the fat in the diet may change to sugar.

Test of Successful Treatment.—Improvement in diabetes takes place when the urine is kept free from sugar. The annoying symptoms of the untreated diabetic then vanish. Under such conditions the power of the pancreas to assimilate carbohydrate is increased. Conversely, if the urine is not free from sugar, the patient is generally only holding his own, or more likely is growing worse. Professor Naunyn, who for a generation was perhaps the leading specialist in diabetes and still lives at a ripe old age, observed that even severe cases if treated early did well, whereas mild cases if neglected usually did poorly.

Examination of the blood for sugar gives valuable informa-

tion in the treatment of diabetes. The sugar in the blood usually rises above normal before sugar in the urine appears. Consequently, if information can be learned about the blood sugar, one often anticipates the information which an examination of the urine alone would show. The knowledge about the blood sugar is still fragmentary, and it must be acknowledged that many cases of diabetes have lived comfortably without a single blood-sugar estimation. However, analyses of the blood sugar are of much value, particularly in the diagnosis of doubtful cases.

In what follows an attempt will be made to show how to treat the disease with diet and insulin, and, since success in treatment is most easily attained by the selection of a diet which will keep the urine sugar-free, detailed advice along dietetic lines will be given. The responsibility for maintaining this favorable state must rest in large measure upon the patient himself. He must learn the diet and the dose of insulin while are best for him and must constantly control his condition by the examination of his urine. He is his own nurse, doctor's assistant, and chemist. If he tries to be his own doctor, he will come to grief. To acquire the requisite knowledge for his triple vocation requires diligent study, but the prize offered is worth while, for it is nothing less than life itself.

CHAPTER II.

THE RECENT IMPROVEMENT IN DIABETIC TREATMENT.

One often hears the remark that patients with diabetes live for years with little inconvenience to themselves, even though strict rules of diet are neglected. This may be a consoling thought to some weak-willed patient, but if the average diabetic yields to such seductive advice, the probability is overwhelming that he will later pay the penalty. Furthermore, such statements are not true. Their origin lies in the favorable course of the large number of mild cases of diabetes, but just as it is a serious blunder in war to disparage the strength of the enemy, so it is in diabetes. Still more recently certain diabetics have improved so much with insulin that they have felt that diet, and occasionally even insulin, too, could be disregarded. Of these latter I have known several who have already died, even though their disease was of short duration.

How serious in the past diabetes has really been, and at the same time how much the methods of treatment have improved during the recent years, is best shown by the statistics for diabetes of the Massachusetts General Hospital. Between 1824 and 1898 for every 100 diabetics who entered the institution 27 died within its walls, but during 1918, which is long before the discovery of insulin, so great had been the improvement by dietetic methods alone that there were but 4 deaths per 100 admissions. During 1923 at the New England Deaconess Hospital and Mrs. Leatherbee's, across the street, 822 cases of diabetes were treated by various physicians with 14 deaths. Concerning these deaths, it is conservative, pathetic, yet encouraging from the point of view of future statistics, to state that half were needless. It

is gratifying that this advance in treatment has come through hard work and not through chance and that multitudes of scientific men and women have shared in it. All will gladly acknowledge the important part which Dr. Frederick M. Allen has taken in bringing this about by his insistence, ten years ago, upon the harmfulness of overfeeding the patient and more recently by Banting and Best, the discoverers of insulin.

The favorable nature of recent hospital statistics demonstrates that the opportunity for further improvement in the treatment of diabetes lies not in the hospital but in the home. To this end a campaign must be aggressively waged. If the mortality can be reduced nearly to zero in the hospital, these same results ought to be attained outside the hospital, for there is no reason why the methods which have made hospital treatment safe should not be employed in making treatment in the home safe. It is unreasonable to expect that the ultimate diabetic mortality in the home will be as low as that in the hospital, because of the shorter duration of stay in the latter, but the time has arrived when the accidental and avoidable deaths, which have now been largely eliminated from the statistics of the best hospitals, should also be eliminated from private practice. The secret of the success of hospital improvement lies in the close and continuous observation of the patient by the doctor. For success in home treatment, close and continuous observation of the patient by himself under the systematic guidance of a physician is just as essential.

Two reasons have prevented doctors in the past from urging patients to return for treatment. Prior to 1914, when the era of striking improvement in diabetes began, physicians feared that any change in treatment might make a patient apparently doing well get worse, and it was considered safer to let well enough alone. In the second place physicians hesitated to ask patients to return for fear of being considered commercial. Today with the more widespread knowledge concerning this disease, both on the part of the doctor and the patient, these two objections should vanish.

Insulin has wrought a revolution in the lives of severe and

moderately severe diabetics. It allows such individuals to take part in large measure in all that goes on about them, just as diet alone enables the mild diabetic to lead a successful existence. With the help of insulin I have seen children go back to school, ministers secure a parish, lawyers reënter court, doctors carry on a hospital service, a nurse resume work. It is true nearly all of these activities are mental or professional activities; consequently, it is well to record that mechanics have been enabled again to carry on occupations which had been renounced for many months and even to perform strenuous labor. And that is not all. A diabetic, the father of eight living children, who entered the hospital with acid poisoning, double valvular heart disease and a bleeding duodenal ulcer, under insulin was freed from sugar and acid so that he underwent operation successfully on March 12, 1923. In three weeks he left the hospital, in another three weeks returned to work, and on February 26, 1924, reported that he had not lost a day's work since he began. Insulin, therefore, not only has changed the severe and moderately severe diabetic into a milder diabetic, but protects all diabetics in times of emergency.

Insulin is your life insurance policy. It is a gift from Banting and Best.

CHAPTER III.

INSULIN.

F. G. Banting, a young orthopedic surgeon with zeal for research undampened by four years' service at the front, discovered insulin, the hormone of the pancreas, which regulates carbohydrate metabolism. He received the assistance of his friend, C. H. Best, who, although a second-year medical school student, was trained in physiological research. Thus, just a generation had elapsed since that other epoch-making discovery in diabetes was announced by von Mering and Minkowski, when they proved that fatal diabetes would follow complete removal of this gland.

Banting and Best write: "The hypothesis underlying this series of experiments was first formulated by one of us in November, 1920, while reading an article dealing with the relation of the isles of Langerhans to diabetes. From the passage in this article, which gives a résumé of degenerative changes in the acini of the pancreas, following ligation of the ducts, the idea presented itself that since the acinous, but not the islet tissue, degenerates after this operation, advantage might be taken of this fact to prepare an active extract of islet tissue. The subsidiary hypothesis was that trypsinogen or its derivatives was antagonistic to the internal secretion of the gland. The failures of other investigators in this much-worked field were thus accounted for.

"The feasibility of the hypothesis having been recognized by Prof. J. J. R. Macleod, work was begun under his direction in May, 1921, in the Physiological Laboratory of the University of Toronto. Help was also generously rendered by Professors Henderson, Fitzgerald, Graham and Defries."

The extract of the islands of Langerhans which Banting and Best obtained first came from a dog. In order to secure

a secretion of the island tissue alone, they caused an atrophy of all the remaining tissue of the gland by the method described in an earlier paragraph. The extract of this atrophied gland, which contained intact the islands of Langerhans, when injected under the skin of a diabetic dog, caused the percentage of sugar in the blood to fall to normal and sugar to disappear from the urine. Banting and Best recognized the importance of their discovery and their efforts with those of their co-workers were at once directed toward the production of the extract in some more practicable manner. In this they were successful, using the pancreas of the fetus of unborn calves, in which the islands are numerous and the rest of the gland inactive. Finally, working with improved methods in which they were aided by Professor Collip, a purified extract was obtained from the pancreas of cattle and hogs.

A word about these islands of Langerhans. These consist of groups of cells, varying in number from a quarter of a million to a million or more in a single pancreas. They are scattered throughout the gland, and yet they form but a twentieth part of it. Their total weight is about that of a buffalo nickel. Originally they were described by Paul Langerhans in Berlin in 1869, just twenty years before von Mering and Minkowski proved that removal of the pancreas would cause diabetes, but it was not until 1901 and 1902 that Opie, in America, and Ssobolew, in Russia, showed that disease of the Langerhans islands and not of the rest of the pancreas was the real cause of diabetes. Twenty years more intervened until in 1921 Banting and Best obtained an extract of these islands of Langerhans which could be used safely in the treatment of diabetic patients.

Insulin is prepared for general use dissolved in a liquid. The dose is measured in units. The standard unit represents one-third of that amount of insulin which will lower the blood sugar of a rabbit to 0.045 per cent. At this point various symptoms appear which end in convulsions and coma, and hence this definite point is taken for the standardization of the unit.

One unit of insulin when injected into a diabetic will enable

him to utilize 1 to 2 grams additional carbohydrate. This is about the quantity of carbohydrate in a small Educator biscuit or something less than half a lump of granulated sugar. Apparently the power of insulin varies with different patients and under different conditions with the same patient. Therefore, one must always proceed cautiously when administering the first doses. The number of units taken in a day by a patient usually lies between 5 and 30 units divided between one, two, or three injections.

If an excess of insulin is given, the blood sugar falls below the normal of 0.1 per cent and symptoms appear which constitute a reaction. The most striking of these are hunger, sweating, trembling and, unless treatment is instituted, unconsciousness may appear. Fortunately these symptoms quickly subside and disappear if the patient is given a little carbohydrate, such as a few teaspoonfuls of orange juice or corn syrup or an equal quantity of sugar. Patients seldom show these reactions, but if they do occur, they are easily recognized and treated by the patients themselves.

The diabetic public was well prepared for insulin when it became available for general use. For twenty years the knowledge of the diabetic diet had been spreading and great advances had been made in its use. So much had been learned of the inter-relation of the different foodstuffs—carbohydrate, protein and fat—to one another that a death from coma could usually be explained by the breaking of dietetic rules and hence was recognized as needless. Already we have seen that the mortality had fallen from 27 in 100 under hospital care to 4 in 100.

Insulin is a remedy which a patient can learn to administer to himself, but it is nevertheless true that it is primarily a remedy for the wise and not for the foolish, be they patients or doctors. Everyone knows it requires brains to live long with diabetes, but to use insulin successfully requires more brains.

Insulin is not more dangerous than morphine, and it has these advantages: Whereas an excess of morphine leads directly to sleep, coma, and death, an overdose of insulin causes a warning train of symptoms, beginning with nervous-

ness and extreme hunger as the blood sugar drops below 0.07 per cent, progressing to sweating and tremor, subconscious or evident, and ending with unconsciousness as the blood sugar reaches 0.03 per cent. Death is possible. Again unlike morphine poisoning recovery follows the simplest of measures, the juice of an orange or 1 to 3 teaspoonfuls of sugar, and takes place promptly within five or ten minutes.

Insulin is a comfort to doctor and patient. Insulin has revolutionized diabetic treatment in more ways than one. It has given the diabetic more food, strength and weight, but it has also carried to the doctor and to the patient a knowledge and respect for the diabetic diet such as has never before existed. If the diabetic wishes to get his money's worth for the insulin he injects, he realizes that he must know what and how much to eat.

CHAPTER IV.

QUESTIONS AND ANSWERS FOR DIABETIC PATIENTS.

Knowledge Essential for a Diabetic.—The treatment of a patient with diabetes lasts through life. Treatment therefore must be adjusted to the condition of the patient and should be so arranged that it can be continued for years, not only without harm, but with as little annoyance and interference with the daily routine as is possible. Consequently, the patient must be taught the nature of his disease and how to conquer it.

In the following questions and answers an attempt is made to indicate the essential features of the knowledge desirable for a diabetic patient.

1. QUESTION. Why does the human body need food?

ANS. To furnish heat, repair waste, and permit growth and exercise.

2. QUESTION. How may the many varieties of food be classified simply?

ANS. Carbohydrate, protein, and fat; also water and salts.

(*a*) QUESTION. Upon what does the nutritive value of food depend?

ANS. The quantity of carbohydrate, protein, and fat which it contains.

(*b*) QUESTION. What is carbohydrate?

ANS. It occurs in many forms, but examples of it are sugar and starch. Cane sugar is the commonest sugar. A pure form of starch is corn starch. Fruits are almost entirely water and sugar and vegetables are largely water and starch.

Bananas, when green, contain nearly 20 per cent starch, but when ripened this changes to sugar. Starchy foods during digestion in the body rapidly change to sugar, and consequently these two foods are nearly interchangeable. Potatoes are 20 per cent starch. Bread is about 55 per cent starch, and the flour out of which it is made, being drier than the bread, contains about 70 per cent. Oatmeal is two-thirds starch, but other cereals contain rather more. Milk contains 5 per cent of sugar. Meat, fish, and eggs are entirely free from carbohydrate, save for an extremely small percentage of animal starch (glycogen) to be found in liver. The quantity of carbohydrate in various foods is shown in Table 2, page 41, and also in Table 3, page 42.

(*c*) QUESTION. What is protein?

ANS. Protein is the food from which muscles and tissues are made. It is therefore an essential constituent of the diet. Examples of protein are lean of meat or fish, curd of milk, and white of egg. The yolk contains just as much protein as the white, but it is mixed with fat. Protein is also found in grains, and there is considerable in beans and peas, but very little in other vegetables, and almost none in fruits.

(*d*) QUESTION. What is fat?

ANS. Examples of fat in its pure form are oil and lard. Butter and substitutes for it contain 85 per cent fat. Rich cream contains about 40 per cent fat, whereas milk may contain but 3 per cent. Common cheese is one-third fat. The percentage of fat in meat varies from that in fat bacon, in which the percentage occasionally rises to 80 per cent, to chicken, in which the percentage of fat is 3 per cent or less. In codfish and haddock the amount of fat is negligible, but in salmon it reaches 13 per cent. Nuts are rich in fat. Fat and carbohydrate are to a large extent interchangeable. In northern climates fat forms a large part of the diet, while in the tropics it is replaced by carbohydrate.

3. QUESTION. Should the diabetic patient know about foods and their relative values?

ANS. Yes. It is of the utmost importance for him to know these things, since (*a*) diabetes is a condition in which the normal utilization of carbohydrate is impaired, and (*b*) the disease is usually due to overeating. Table 3 contains a list of foods which are most commonly eaten by diabetic patients, and, indeed, by normal individuals. It will repay study. Anyone who masters this table will know how to secure a diet containing the desired amount of carbohydrate, protein, and fat.

4. QUESTION. What is the proof that the diabetic does not make normal use of the carbohydrate eaten?

ANS. The appearance of sugar in the urine.

5. QUESTION. How much sugar is lost in the urine?

ANS. From a mere trace to 2 pounds in the twenty-four hours (Fig. 15, page 118). The percentage in the urine seldom amounts to as much as 10 per cent, which is the percentage of sugar in an orange.

6. QUESTION. How is the urine tested for sugar?

ANS. In many ways. The Benedict test is one of the most reliable (page 196).

7. QUESTION. Why are untreated diabetics unusually hungry?

ANS. Because they must eat enough to sustain life and in addition enough to make up for the sugar lost in the urine (pages 116–118).

8. QUESTION. Why are diabetics abnormally thirsty?

ANS. Because they must produce enough urine to dissolve the sugar and thus remove it from the body.

9. QUESTION. What is the aim of treatment?

ANS. The improvement of the condition of the patient, which is best indicated by the excretion of urine which is sugar-free and by a normal quantity of sugar in the blood. See Question 14.

10. Question. What is the nature of the treatment?

Ans. Restriction of the variety and quantity of the food to such an extent as will remove sugar from the urine; the cultivation of the simple life and moderate, regular exercise and work. If these ends cannot be attained without insulin, it should be employed.

11. Question. What are the sources of sugar in the urine?

Ans. First, the carbohydrate in the diet; second, the protein; third, the fat. From 100 grams of carbohydrate approximately 100 grams of sugar can be formed. From 100 grams of protein it is theoretically possible to form 58 grams of sugar, and from 100 grams of fat, 10 grams of sugar. In diabetes sugar may appear in the urine irrespective of the diet because the body may consume the protein and fat of which it is itself composed. Moreover, whenever the total diet is in excess, irrespective of any particular food, the power of the body to assimilate carbohydrate lessens. Hence the danger to the diabetic in overfeeding.

12. Question. Is sugar present in the blood of healthy people?

Ans. Yes. It amounts to about 0.1 per cent normally if the blood is examined before breakfast. After a meal the percentage increases to about 0.14 per cent, but drops to normal within approximately two hours.

13. Question. Why is the blood tested for sugar if the urine is known to be sugar-free?

Ans. To determine whether the diet should be increased. The results of a faulty diet can be detected earlier in the blood than in the urine. The diet should not be increased, as a rule, unless the blood sugar is normal. In certain rare cases the sugar in the blood is normal and yet sugar is present in the urine. These are not true cases of diabetes, but are known as examples of renal glycosuria.

14. Question. Is treatment of diabetes beneficial?

ANS. Yes, in the large majority of instances it cures disagreeable symptoms; it prevents dangerous and painful complications; it prolongs life; and it enables one to lead an almost normal existence. If treatment is not followed, the diabetes grows worse.

15. QUESTION. How does the diabetic diet differ from the normal diet?

ANS. By the smaller quantity of carbohydrate, fewer calories, and the greater quantity of fat. (Table 11, page 67 and Fig. 10, page 68 and Fig. 11, page 69).

16. QUESTION. What is a calorie?

ANS. A calorie is a unit of heat. It represents the amount of heat which is required to raise 1 kilogram of water 1 degree Centigrade, or approximately 1 pound of water 4 degrees Fahrenheit.

17. QUESTION. How many calories are produced in the body by the utilization or oxidation of 1 gram of carbohydrate, protein, and fat?

ANS. One gram carbohydrate produces 4 calories; 1 gram protein produces 4 calories; 1 gram fat produces 9 calories; 1 gram alcohol produces 7 calories.

18. QUESTION. How much food does a diabetic patient need?

ANS. About 20 to 30 calories per kilogram body weight or 10 to 14 calories per pound. This is a little less than for the ordinary individual.

19. QUESTION. How is the treatment of diabetes begun and sugar removed from the urine, or, in other words, how is the patient made sugar-free?

ANS. In mild cases by eating less and exercising more, with a consequent loss of weight, in moderate cases by still greater reduction in the total diet with especial decrease in carbohydrate, and in severe cases by the measures already described and in addition the reduction of the protein to a very small quantity.

20. QUESTION. When the urine of the patient is sugar-free, what is done next?

ANS. The diet is gradually increased, slightly in carbohydrate and protein, liberally in fat, meanwhile testing the urine daily to determine whether the total quantity of food and the different varieties of it are tolerated without the return of sugar in the urine or excess of sugar in the blood.

21. QUESTION. How does insulin help?

ANS. Insulin enables the patient to get the benefit of the carbohydrate which he eats. One unit of insulin "burns up" 1 to 2 grams of carbohydrate. If a patient utilizes carbohydrate, the danger of acidosis (diabetic coma) largely disappears.

22. QUESTION. What is the dose of insulin?

ANS. It varies with the case. A patient requires enough units to enable him to secure enough food to maintain vigor and a reasonable body weight.

23. QUESTION. Must insulin be continued indefinitely?

ANS. Not in the milder cases. In many instances it may be reduced in quantity.

24. QUESTION. What are the chief dangers in the use of insulin?

ANS. There are two dangers.

(*a*) Diabetic coma can ensue if insulin is omitted without a simultaneous lowering of the diet. If the diet is cut in half when the insulin is omitted this danger disappears.

(*b*) A *reaction* occurs and the blood sugar falls below normal, if too much insulin is given. A reaction is manifested by hunger, tremor, sweating, unconsciousness. Other symptoms are pallor, faintness, nervousness, dilated pupils. The urine is free from sugar. These symptoms disappear if a little carbohydrate, such as the juice of an orange, 2 or 3 teaspoonfuls of corn syrup, or 2 or 3 lumps of sugar, are taken.

25. Question. What can a diabetic patient do for himself besides keeping the urine sugar-free?

Ans. Be cheerful and also be thankful that his disease instead of being of a hopeless character is one which his brains will help him to conquer. He can keep his temper under control and his skin and teeth scrupulously clean. He should avoid people with colds in the head and sore throats; secure a daily action of the bowels; sleep nine or more hours at night and invariably take at least one-half hour off for rest during the day; exercise moderately in the forenoon, afternoon and evening.

26. Question. How can you help to prevent the development of diabetes in your children and friends?

Ans. By explaining to them the dangers of obesity and telling them of easy ways by which to escape it: such as, (1) to leave the table a little hungry, avoiding second helpings, (2) to satisfy the stomach with unnourishing 5 per cent vegetables instead of with bread and butter, which are fattening, (3) to omit lunches and candy and sodas between meals, (4) to use skimmed milk instead of cream. Encourage exercise, abundant sleep, and energetic, yet restful, vacations.

27. Questions. How can acid poisoning be prevented?

Ans. By keeping the urine sugar-free. If a patient feels ill and is in doubt about acid poisoning he had better consider it to be present, call his doctor and (1) go to bed; (2) drink slowly a cupful of hot water every hour, tea, coffee, clear thin broth, or water-oatmeal gruel or orange juice. If nauseated, take the same quantity of liquid by enema in the form of salt solution (a level teaspoonful of salt to the pint of water); (3) keep warm; (4) move the bowels by injection; (5) procure a nurse, or someone to act as nurse. Thereby he is relieved of all responsibility and work in carrying out the above treatment.

28. Question. Why are operations often dangerous for diabetic patients?

Ans. Because of the possibility of serious acid poisoning.

29. Question. What anesthetics are to be avoided in case of a surgical operation?

Ans. Chloroform and ether. The latter may be employed under special precautions with the aid of insulin.

30. Question. What anesthetics are sometimes employed in their stead?

Ans. Novocaine, cocaine, nitrous oxide gas and oxygen, spinal anesthesia.

A diabetic patient at the beginning of treatment should be made to understand that he is taking a course in diabetes.

For successful graduation in the course he should demonstrate his ability:

1. To test the urine for sugar (page 196).
2. To serve himself with approximate accuracy, without scales, 150 grams of a 5 per cent vegetable (pages 40–42).
3. To record a summary of his diet for the previous day (page 44).
4. To explain the quantity of carbohydrate which it contains (pages 37–46).
5. To describe what he is to do if sugar returns in the urine (page 91).
6. To describe what he is to do if he has reason to believe that he is threatened with acid poisoning (pages 106–108).
7. To know what to eat while traveling if his usual diet is not available.
8. To give insulin to himself and to know when to give it.
9. To state the dangers of (*a*) too much insulin, and (*b*) of its total omission (page 34).
10. To care for his feet in order to avoid blood poisoning and gangrene which are fatal to so many diabetics (page 122).

CHAPTER V.

DIABETIC ARITHMETIC.

It is far simpler in computations of the diet to use the metric than the avoirdupois system. Unfortunately, the more general employment of scales registering pounds and ounces makes this at times difficult. For this reason it is well to know both the metric and avoirdupois systems and to be able to convert the one into the other. The essential values are given in Table 1.

Table 1.—The Metric and Avoirdupois Systems Compared.

	DRY MEASURE.		
30 grams	= 1 ounce[1] :	16 ounces	= 1.0 pound
1000 grams	= 1 kilogram		= 2.2 pounds
	LIQUID MEASURE.		
30 cubic centimeters	= 1 fluidounce[2] :	32 ounces	= 1 quart
1000 cubic centimeters	= 1 liter		
	CALORIES.		
1 gram carbohydrate	= 4 calories		
1 gram protein	= 4 calories		
1 gram fat	= 9 calories		

The unit of weight in the metric system is a gram. It is easy to visualize the relative value of a gram when it is known that a nickel, five-cent coin, weighs exactly 5 grams, a shredded wheat biscuit weighs 30 grams, and so do three large portions of butter or six of the large lumps of sugar. The average egg weighs 60 grams and a banana (peeled) 100 grams. A kilogram is equivalent to 2.2 pounds. Kilograms become more homelike when one's own weight is changed into kilograms. Thus a weight of 132 pounds avoirdupois is 60 kilograms metric.

[1] Actually 28.4 grams.

[2] Actually 29.6 grams.

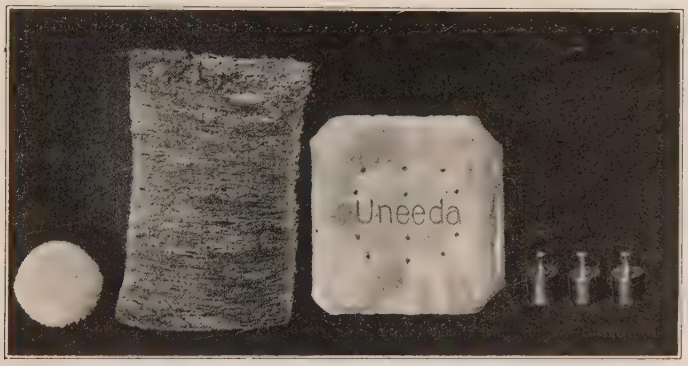
a *b*

FIG. 1.—*a*, teaspoon, capacity 5 cubic centimeters (cc); *b*, tablespoon, capacity 15 cubic centimeters (cc) or $\frac{1}{2}$ ounce.

a *b* *c* *d*

FIG. 2.—*a*, cream, $\frac{1}{2}$ pint or 240 cubic centimeters (cc); *b*, drinking glass, capacity 8 ounces; *c*, 250 cubic centimeters (cc) graduate, contains $\frac{1}{2}$ pint fluid; *d*, measuring cup, capacity 8 ounces.

The unit of weight in liquid measure in the metric system is the cubic centimeter. A cubic centimeter of water weighs 1 gram. Thirty cubic centimeters make a fluid ounce, which



a *b* *c* *d*

FIG. 3.—*a*, butter, 10 grams; *b*, shredded wheat, 30 grams; *c*, Uneeda Biscuit, 6 grams; *d*, three 10-gram weights.

a *b* *c* *d*

FIG. 4.—*a*, 5 gram weight; *b*, lump sugar, weight, 5 grams; *c*, oyster crackers, weight, 5 grams; *d*, buffalo 5-cent piece, weight, 5 grams.

is approximately equal to two tablespoonfuls of water. One thousand cubic centimeters are a little more than a quart.

In estimating carbohydrate, protein, and fat in the diet or sugar in the urine, enough accuracy is obtained in clinical

work by considering that 30 grams (gm.) or 30 cubic centimeters (cc) equal an ounce, dry or fluid measure.

The foods upon which diabetic patients live are nearly all printed in Tables 2 and 3 and are shown in Fig. 11 page 69 as well. Most of the foods in Table 2 come under the head of 5 per cent vegetables. By this is meant that not over 5 per cent (or 5 grams in each 100 grams) of these vege-

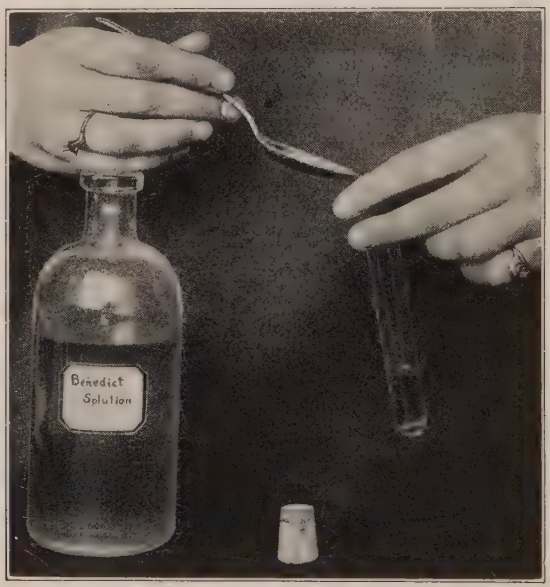


FIG. 5.—One teaspoonful (5 cubic centimeters (cc)) of Benedict's solution in a test-tube.

tables may be counted as carbohydrate. As a matter of fact, lettuce, at the beginning of the first column, contains 2.2 per cent, and string beans, toward the bottom of the second column, occasionally contain as much as 6 per cent carbohydrate. The average percentage of carbohydrate for the entire group would be about 3 per cent, or 1 gram carbohydrate for each (1 ounce) 30 grams of vegetables. A large saucerful of a 5 per cent vegetable weighs about 150 grams and contains

about 5 grams of carbohydrate. Another reason for reckoning these vegetables at 3 per cent available carbohydrate is that when they are cooked considerable carbohydrate is lost in the water used in the cooking. This also applies to vegetables in the 10 per cent column, and these vegetables are reckoned as containing 6 per cent carbohydrate or 2 grams to the ounce. In the 15 per cent and the 20 per cent vegetables about their full value is available. Fruit, also, must be reckoned as containing the full quantity of carbohydrate assigned to it in the column in which it occurs. Patients seldom need to know the food values of more than the 19

TABLE 2.—FOODS ARRANGED APPROXIMATELY ACCORDING TO CONTENT OF CARBOHYDRATE.

Vegetables (fresh or canned).

5 per cent.[1]		10 per cent.[1]	15 per cent.[1]	20 per cent.[1]
1–3 per cent.	3–5 per cent.			
Lettuce	Tomatoes	String beans	Green peas	Potatoes
Cucumbers	Brussels	Pumpkin	Artichokes	Shell beans
Spinach	sprouts	Turnip s	(Jerusalem)	Baked beans
Asparagus	Water cress	Kohl-rabi	Parsnips	Green corn
Rhubarb	Sea kale	Squash	Lima beans	Boiled rice
Endive	Okra	Beets	(very young)	Boiled
Marrow	Cauliflower	Carrots		macaroni
Sorrel	Egg plant	Onions		
Sauerkraut	Cabbage	Green peas		
Beet greens	Radishes	(very young)		
Dandelions	Leeks			
Swiss chard	String beans,			
Celery	(very young)			
Mushrooms	Broccoli			
	Artichokes			
	Globe			
		Fruits.		
Ripe olives (20 per cent fat)		Strawberries	Raspberries	Plums
Grapefruit		Lemons	Currants	Bananas
		Cranberries	Apricots	Prunes
		Peaches	Pears	
		Pineapple	Apples	
		Blackberries	Blueberries	
		Oranges	Cherries	

[1] Reckon average carbohydrate in 5 per cent vegetables as 3 per cent; of 10 per cent as 6 per cent.

foods mentioned in Table 3. Patients are advised to buy gram scales, but since many households already have ounce scales, Table 3 is so arranged that the quantities of carbohydrate, protein and fat in an ounce (30 grams) of food are placed opposite that food. There are a few exceptions. The values for six oysters and one egg are given instead of for 30 grams of these foods. In Chapter XIX are given the actual percentage values for carbohydrate, protein and fat in all foods.

TABLE 3.—THE QUANTITY OF CARBOHYDRATE, PROTEIN AND FAT AND THE CALORIC VALUE OF 30 GRAMS (ONE OUNCE) OF FOODS IN COMMON USE.

30 grams (1 oz.) containing approximately	Carbohydrate, gms.	Protein, gms.	Fat, gms.	Calories.
Vegetables, 5 per cent	1.0	0.5	0	6
Vegetables, 10 per cent	2.0	0.5	0	10
Shredded wheat	23.0	3.0	0	104
Uneedas, 2	10.0	1.0	1	53
Potato	6.0	1.0	0	28
Bread	18.0	3.0	0	84
Oatmeal, dry weight	20.0	5.0	2	118
Oysters, 6	4.0	6.0	1	49
Milk	1.5	1.0	1	19
Meat(cooked, lean)	0.0	8.0	5	77
Fish	0.0	6.0	0	24
Chicken (cooked lean)	0.0	8.0	3	59
Egg, 1	0.0	6.0	6	78
Cheese	0.0	8.0	11	131
Bacon	0.0	5.0	15	155
Cream, 20 per cent	1.0	1.0	6	62
Cream, 40 per cent	1.0	1.0	12	116
Butter	0.0	0.0	25	225
Oil	0.0	0.0	30	270

The reason for inserting the food value of dry oatmeal instead of cooked oatmeal is due to the variable quantity of water which it takes up during cooking. There is far less difference in the weights of preparations of dry oatmeal.

The division of the diet of a patient weighing 123 pounds ($123 \div 2.2 = 56$ kilograms) is giving in Table 4. In the first column of the table is recorded a list of the different foods taken during the day. Of 5 per cent vegetables 300 grams, or 10 ounces, were given for dinner and 300 grams for supper, making a total for the day of 600 grams. A small

orange was given at noon and night. Oatmeal, 30 grams, were given at breakfast. One egg was given at breakfast and another at supper. The cream, 240 cc for the day, was

FIG. 6.—Food scales weighing 500 grams.[1] The pointer is at 30 grams, which is the equivalent of 1 ounce. This is the weight of the shredded wheat biscuit shown on the scale pan. An ounce is the maximum weight of a letter, which the United States Government will deliver for two cents.

divided between the three meals. Fifteen grams of bacon were allowed at breakfast and at supper. The butter was

[1] Convenient food scales of 500 grams' capacity with movable dial are made by John Chatillon & Sons, 89 Cliff Street, New York City.

TABLE 4.—SUMMARY AND COMPUTATION OF A DAY'S DIET WITH CALCULATIONS BASED ON TABLES 2 AND 3.

NAME DATE

Food.	Breakfast.	Dinner.	Supper	Total gms.	Carbohydrates.	Protein.	Fat.
5% vegetables	...	300	300	600	20	10	0
Orange	....	100	100	200	20	0	0
Oatmeal	30	...	...	...	20	5	2
Shredded Wheat							
Uneeda							
Potato							
Egg	1	...	1	2	.....	12	12
Cream, 20%	80	80	80	240	8	8	48
Bacon	15	...	15	30	0	5	15
Butter	...	15	15	30	0	0	25
Meat	...	60	...	60	0	16	10
Carbohydrates				Grams	68	56	112
Protein				Calories	4	4	9
Fat							
			Total calories = 1504		272	224	1008

For Sale by Thomas Groom & Co., Inc.
105 State St., Boston, Mass.

Form J. 9. B.

given at noon and night, and the meat was given at dinner. Knowing the total quantity of each variety of food eaten by the patient during the day, by using the table of food values (Table 3) one can determine the amount of carbohydrate, protein, and fat for each given food. Thus, 600 grams of 5 per cent vegetables were used. Table 3 shows that for each 30 grams (1 ounce) of 5 per cent vegetables there is 1 gram[1] carbohydrate and 0.5 gram protein, and therefore in 600 grams (20 ounces) there would be 20 grams carbohydrate and half as many grams proteins, or 10. Oranges are not recorded in Table 3 but are to be reckoned as containing 10 per cent carbohydrate. The 30 grams of oatmeal, weight taken previous to when it was cooked, contained, according to Table 3, carbohydrate, 20 grams, protein, 5 grams and fat, 2 grams.

Two eggs were given. Table 3 shows that the eggs contain no carbohydrate, but that each egg contains 6 grams protein and 6 grams fat—in other words, 2 eggs contain 12 grams protein and 12 grams fat. In the same way one can reckon the amount of carbohydrate, protein and fat in 240 grams (cubic centimeters) of 20 per cent cream (*i. e.*, cream containing 20 per cent butter fat), 30 grams of bacon, 30 grams of butter, and 60 grams of meat (cooked).

The actual percentages of carbohydrate, protein, and fat in various other foods are given in the large tables on pages 166-192. From these it is easy to calculate the quantity of carbohydrate, protein and fat in any food which a patient takes when the total quantity of food eaten is known. Patients and nurses are repeatedly confused by such tables, forgetting that if the quantity of carbohydrate in milk is 5 per cent, 100 grams of milk (or in this case cubic centimeters) would contain 5 grams of carbohydrate, just as 5 per cent interest on $100 for a year would be $5. Lobster, for instance, contains 16 per cent protein, and therefore 100 grams of lobster contain (100×0.16) 16 grams protein.

One should be familiar with percentages, because in this way one can often find the values of various foods which are

[1] Arithmetically, 1.5 grams, but on account of variations of carbohydrate in vegetables, and on account of losses by cooking, as well as for convenience reckoned as 1 gram.

not contained in the 30-gram (1-ounce) table. Should a patient, for example, wish to substitute his 8 grams of protein in the form of 30 grams of meat for 8 grams protein in the form of lobster, this could be done by his taking $\left(\frac{8}{0.16}\right)$ 50 grams of lobster which contains 16 per cent protein.

The use of percentages, however, is employed far more in determining the quantity of sugar voided in the urine by diabetic patients during the twenty-four hours. If an individual voids 2000 cc (cubic centimeters) of urine and the percentage of sugar is 5 per cent, it is plain that the quantity of sugar lost in the urine during the twenty-four hours would be $2000 \times 0.05 = 100$ grams. As a lump of sugar amounts to about 5 grams, this would mean that the equivalent of 20 lumps of sugar was lost in the urine in one day.

It is interesting to compare the decrease of sugar in the urine with the reduction of carbohydrate in the diet.

This is shown in Table 5, which is far more simple than it appears to be at the first glance. Incidentally the table illustrates the excellent results obtained by dietetic treatment without the aid of insulin.

TABLE 5.—ILLUSTRATION OF AMBULATORY TREATMENT WITHOUT FASTING OR OMISSION OF PROTEIN. CASE NO. 1237. AGE AT ONSET IN SEPTEMBER, 1915, THIRTY-NINE YEARS AND FIVE MONTHS.

Date, 1917.	Urine.				Diet in grams.					Dietary prescriptions in grams.							
	Volume, c.c.	Diacetic acid.	Sugar.		Carbohydrate.	Protein.	Fat.	Calories.	Weight, pounds, dressed.	Vegetables, 5 per cent.	Fish.	Orange.	Meat.	No. of eggs.	Bacon.	Butter.	Cream, 20 per cent.
			Per cent.	Total gms.													
Feb. 17	4000	0	8.4	336													
19	1500	0	2.2	33	54	84	0	....	...	720	360	300					
20	1500	0	1.8	27	54	84	0	....	...	720	360	300					
21	1250	0	1.8	23	39	84	0	....	142	720	360	150					
22	1500	0	0.4	6	24	84	0	432	...	720	360	0					
23	1250	0	0.2	3	24	84	0	432	...	720	360	0					
24	1500	0	Tr.	0	24	84	0	432	...	720	360	0					
25	1500	0	Tr.	0	24	84	15	567	139	720	240	0	90				
26	....	0	0	0	24	84	39	783	...	720	120	0	90	4			
27	1250	0	0	0	24	82	57	937	...	720	120	0	90	2	60		
Mar. 1	....	0	0	0	24	82	82	1162	...	720	120	0	90	2	60	30	
3	....	0	0	0	26	84	94	1286	138	720	120	0	90	2	60	30	60
6	...	0	0	0	32	85	106	1422	...	720	120	50	90	2	60	30	90
9	....	0	0	0	42	85	106	1462	136	720	120	150	90	2	60	30	90
13	....	0	0	0	54	87	168	2076									

CHAPTER VI.

EFFICIENCY IN VISITS TO A DOCTOR.

A PATIENT frequently fails to get the benefit he should derive from a visit to his physician because he does not furnish the facts upon which advice for further treatment can be based. Physical appearance alone is by no means a sufficient guide to the careful doctor. Information must be presented concerning the urine, the diet, units of insulin taken, and often concerning the blood. The efficient coöperation of the patient is necessary.

1. **Information Obtained by Examination of the Urine.**—The physician should know whether the urine of the patient is free from sugar, or, if present, how much it contains. This is essential in order to prescribe the diet for the following days. The patient should therefore take with him a specimen of the urine saved from the entire twenty-four-hour amount. To collect such a specimen of urine, discard that voided at 7 A.M. and then save all urine passed up to and including that obtained at 7 the next morning. Take 120 cc (4 ounces) of the thoroughly mixed twenty-four-hour quantity for examination. Record the twenty-four-hour amount of urine, the date, and the name on the bottle. The bottle in which the urine is being collected should be kept in a cool place. It is best to procure a bottle[1] for this special purpose sufficiently large to hold the entire twenty-four-hour amount of urine. Select a bottle with a large mouth, that it may be more easily cleansed. The bottle should be scalded out daily. It should have a tight-fitting cork. Urine so collected decomposes slowly. On account of the presence of sugar, diabetic urines are prone to ferment, and if fermentation occurs, a portion

[1] Bottles known to the druggists as percolator bottles and graduated in 100 cc up to 2000 cc are most convenient.

of the sugar disappears and invalidates any subsequent test for the quantity of sugar which the urine may have contained when voided. A good preservative is xylol of which ½ teaspoonful can be placed in a 2-quart bottle before the collection of urine begins.

From the difference between the total quantity of sugar in the urine and the carbohydrate in the diet it is possible to learn how much of the carbohydrate of the diet has been assimilated by the body and how much has been lost in the urine. Mild cases of diabetes may consume in the food 100 grams of carbohydrate and lose only 10 grams in the urine; moderately severe cases may excrete 5 times this quantity, and very severe cases will excrete not only the full amount of carbohydrate eaten, but, in addition, sugar which they have formed from protein and fat.

The use of insulin has emphasized the value of the examination of single specimens of urine. The urine voided before a meal may be free from sugar, while that voided one or two hours after eating may show sugar. This indicates that either the carbohydrate should be reduced at that particular meal or the insulin increased before it. The desirability of saving the day's urine in four portions, forenoon, afternoon, evening, night, is therefore obvious.

2. **Information Obtained by Examination of the Diet.**—The quality and quantity of the food eaten during the twenty-four hours should be recorded. If thirty minutes are allowed for a visit to the physician's office, it is no exaggeration to say that unless this summary of the diet is kept, one-third to one-half of the visit is spent by the physician in learning what the patient has eaten. For this reason patients should always bring a diet list arranged according to some such plan as that shown in Table 4 (page 44) or on pages 50 and 67.

Even if the quantities of carbohydrate, protein, fat, and calories are not worked out by the patient, the grouping together of 5 per cent vegetables, the day's summary of the total quantity of butter, cream, meat, eggs, fish, oatmeal, and fruit, rather than the hit-or-miss record of the amount taken at each meal, saves an enormous amount of time which

can be employed far better by the physician in giving helpful advice. In other words the patient should go to the physician for treatment rather than for a lesson in grammar-school arithmetic.

3. **Insulin.**—An accurate record of the amount of insulin taken should be furnished. From what has just been said about the fleeting appearance of sugar in the urine after meals, it is important to know how many units of insulin have been employed during the day, the number of doses, before what meals, and how many minutes before a meal. Information of this character helps enormously in the decision as to the future diet and a possible rearrangement of the methods of insulin medication.

4. **Information Obtained by Examination of the Blood.**—Frequently the course of treatment of a case of diabetes is regulated by the quantity of sugar in the blood. If the sugar in the blood can be kept at the normal figure before a meal, 0.1 per cent, and at not over 0.16 per cent three or four hours after a meal, the patient is unlikely to show sugar in the urine. It is advantagous to make the blood-sugar tests before breakfast, or, failing that, just before a meal. Exceptional cases demand a test after eating. The blood sugar usually reaches its greatest height in normals about one-half hour after a meal, but in diabetics the peak comes later and the curve falls more slowly to the normal level.

5. **Body Weight.**—If the patient has scales, the weight fasting, and preferably undressed, on the morning of the visit should be taken.

6. **Notebook.**—The patient should start a notebook on the first day of treatment and show it to his physician at each visit. All questions about symptoms and diet which have arisen since the former visit should be set down neatly with space left for an answer to each question. It is a common error for patients to ask the same question many times, whereas if the answer is written down by the physician the question would thus be answered once for all time. Furthermore, it is a great advantage for a patient to keep a notebook, because gradually it becomes valuable for reference, and his whole plan of treatment is systematized.

Mary, No. 1949.

TABLE 6.—RECORD OF URINE, DIET, AND INSULIN.

Date, 1924.	Urine.		Diet in grams.				Weight.	Dietary prescriptions in grams.													Insulin, units.
	Volume, cc.	Sugar, per cent.	Carbohydrate.	Protein.	Fat.	Calories.		Egg.	5% vegetables.	10% vegetables.	Meat.	Milk.	Fish.	Oatmeal.	Butter.	Cod-liver oil.	20% cream.	Oranges.	Artichokes.	Chicken.	
Feb. 14–15	2370	0	50	45	78	1082	47.4	3	450	60	30	60	0	15	20	5	150	130	0	0	3½
15–16	1900	0	50	45	78	1082	47.1	3	450	60	0	60	40	15	20	5	150	130	0	0	3½
16–17	1905	0	60	45	78	1122	48.1	3	450	60	30	60	0	15	20	5	150	130	65	0	3½
17–18	1910	0	50	45	78	1082	48.5	3	450	60	30	60	0	15	20	5	150	130	0	0	3½
18–19	2000	0	50	45	78	1082	47.4	3	450	60	30	60	0	15	20	5	150	130	0	0	3½
19–20	2015	0	50	45	78	1082	47.8	3	450	60	30	60	0	15	20	5	150	130	0	0	3½
20–21	2100	0	60	45	78	1122	47.1	3	450	60	30	60	0	15	20	5	150	130	65	0	3½
21–22	2096	0	50	45	78	1082	48.1	3	450	60	30	60	0	15	20	5	150	130	0	0	3½
22–23	2080	0	50	45	78	1082	48.1	3	450	60	0	60	40	40	20	5	150	130	0	0	3¼
23–24	2070	0	60	45	78	1122	48.2	3	450	60	30	60	0	15	20	5	150	130	65	0	3¼
24–25	2005	0	50	45	78	1082	48.2	3	450	60	30	60	0	15	20	5	150	130	0	0	3¼
25–26	2000	0	50	45	78	1082	47.1	3	450	60	30	60	0	15	20	5	150	130	0	0	3¼
26–27	2010	0	50	45	78	1082	47.1	3	450	60	30	60	0	15	20	5	150	130	0	0	3¼
27–28	2005	0	50	45	78	1082	48.3	3	450	60	30	60	0	15	20	5	150	130	0	0	3¼
28–29	2000	0	60	45	78	1122	47.1	3	450	60	30	60	0	15	20	5	150	130	65	0	3¼
Mar. 29– 1	1900	0	50	45	78	1082	47.1	3	450	60	0	60	40	15	20	5	150	130	0	0	3¼
1– 2	2000	0	60	45	78	1122	48.6	3	450	60	30	60	0	15	20	5	150	130	65	0	3¼
2– 3	2370	0	50	45	78	1082	49.0	3	450	60	0	60	0	15	20	5	150	130	0	30	3¼
3– 4	2196	0.2	50	45	78	1082	48.0	3	450	60	0	60	0	15	20	5	150	130	0	30	3¼
4– 5	2190	0	50	45	78	1082	48.8	3	450	60	30	60	0	15	20	5	150	130	0	0	3¼
5– 6	2018	0	60	45	78	1122	47.1	3	450	60	30	60	0	15	20	5	150	130	65	0	3¼
6– 7	2015	0	50	45	78	1082	47.1	3	450	60	30	60	0	15	20	5	150	130	0	0	3¼
7– 8	2000	0.2	50	45	78	1082	48.5	3	450	60	0	60	40	15	20	5	150	130	0	0	3¼
8– 9	2100	0	60	45	78	1122	47.5	3	450	60	30	60	0	15	20	5	150	130	65	0	3¼

The notebook should contain a statement as to whether sugar has been present or absent in the urine since the last report to the physician. Such data can be gathered on one page and again thus save time. When a patient comes to my office with a single specimen of urine instead of a portion taken from the twenty-four-hour quantity, without any record of the food eaten during the preceding day, and starts in to recount that he had nothing but eggs, meat, and fish, then later remembers that he had a little cream and various vegetables, then with prompting recalls butter and an orange and a little oatmeal, I always pity him, and on very exceptional occasions am able to recall with satisfaction after the interview Solomon's soliloquy in Proverbs xvi, verse 32.

I have received charts like that in Table 6 for nearly four years from a little girl who contracted diabetes at the age of six years and came to me five months later weighing 44 pounds. Gradually her weight fell to 33 pounds, but with insulin she has grown in height and gained 15 pounds and is now taking $3\frac{1}{2}$ units a day with a diet of carbohydrate 50 grams, protein 45 grams, fat 78 grams, and an additional 10 grams of carbohydrate in the form of 65 grams of artichokes every other day. It will now be possible to increase the fat in the diet, but I am not desirous for the child to gain over 8 or 10 pounds in a year.

CHAPTER VII.

HYGIENE FOR THE DIABETIC.

Any agency which promotes physical or mental hygiene is a step toward the prevention of diabetes in the predisposed and the abatement of its severity in those who have acquired it. The modern diabetic diet and insulin make unnecessary the erstwhile sound advice that diabetics "should be kept mentally indolent and physically active." Nevertheless, patients should remember they are not absolutely well and should allow for this by taking more relaxation each day and more vacations each year than their friends. There are as few diabetics who are restricted to one-fifth of a day's work as there are those who ought to attempt over four-fifths of a day's work. Therefore, all individuals who have a tendency toward diabetes should be especially urged to take vacations.

Dr. Sabine, of Brookline, has made the remark, based upon the experience of his many years of general practice, that those of his patients who took active camping trips in the woods bore the stress of modern life best. By this means exercise was combined with mental relaxation. That the good effects of each last for months is not hard to believe. It is only natural to conclude that if the muscles, in which is stored one-half of the carbohydrate of the body, are kept in good condition by training, a favorable effect must be produced upon the general metabolism of carbohydrate. Pedometers are to be encouraged. It is better to discuss how far you have walked than how little you have eaten. The effect of increase of exercise upon the well-being of fat diabetics has been pronounced, and it is striking how many miles a semi-ill or obese diabetic patient can learn to walk in two weeks. The patients are encouraged to take their

walks soon after meals and to go outdoors at least 5 times in the day. The good effects of exercise are shown not only by the freedom of the urine from sugar and an increased carbohydrate tolerance, but by improved circulation and general well-being. No case should be considered too far advanced for an attempt at muscular redevelopment. Patients themselves realize the value of exercise. More of them upon rising should spend three to five minutes in gymnastic exercises than is apt to be the case.

Exercise burns up carbohydrate just as does insulin. Case No. 1889 walked ten miles one morning and developed an insulin reaction; the next day without exercise but with diet and dose unchanged no reaction appeared.

If the patient by means of exercise can have 5 grams more of carbohydrate a day, the added comfort will be enormous, for the addition of 5 grams of carbohydrate to a diet in a case of severe diabetes brings almost untold joy. It allows various alternatives, such as 100 grams of grapefruit, 70 grams of strawberries, 50 grams of orange, a small tablespoonful of cooked oatmeal, or an Uneeda biscuit.

Case No. 1024, a lady, aged seventy-eight years, not only took exercise in the forenoon and afternoon, but went out for her walk in the evening with a flash light.

Case No. 804, a patient whose diabetes changed from severe to moderate and finally from moderate to mild under his own care at home, wrote that he considered exercise of the greatest importance. He said that he had the best garden of anyone in his city.

Case No. 352 outlived his expectation of life, having had diabetes twenty-three years, and throughout this time he led a most active existence. He wrote:

"First, it is very hard to start the exercise, and the less one feels inclined to start it the more one needs it. Second, it is neither necessary nor desirable that the exercise should be violent. I found a quiet ride of an hour, walking or jogging, after taking something on the stomach started up my old metabolism for the whole day. If I rode hard, I got tired out."

Finally, it is astonishing how much exercise a diabetic in

training can take. One of my severe cases, living on a strict diet, several years ago walked between twenty and thirty miles in one day. Inquiry elicited the following letter from Case No. 783, a Harvard student, who frequently shows a small trace of sugar, a case which borders upon the renal type of glycosuria. The blood sugar one morning before breakfast was 0.07 per cent:

CAMBRIDGE, MASS., December 1, 1915.

"I first noticed the effect of exercise last spring. I was rowing for exercise at the time and observed that if I went out on the river about a half-hour after lunch and rowed for an hour or less the test would not show any sugar in the urine at any time during the afternoon, even though I ate potatoes and a small amount of bread for lunch. But if I ate potatoes (no bread) without so exercising the test always showed sugar about two hours after the meal."

Rest is essential. A tired child is put to bed and wakens refreshed; one of the most noted surgeons in our country is not ashamed to leave his guests at the table and lie down for fifteen minutes after his luncheon; the best treatment for a failing heart is to put its owner in bed for a week. Diabetic patients should rest often, should never allow themselves to get overtired, and should avoid athletic contests. The diet is designed to give a rest to the pancreas. Sleep nine hours, and more if you can, and get another hour of rest by day. Short periods of complete relaxation yield maximal returns.

Forget you have diabetes and do not talk about it with others. This is one reason for not using saccharin, and another is to avoid the perpetuation of a sweet taste, thus reviving the thought of the previously unrestricted diet.

Mental diversion is desirable, but anxiety is harmful. Heavy responsibilities should be avoided as well as nervous upsets and emotional excitements. It is almost as dangerous for a diabetic to get angry as it is for a man with angina pectoris. Case No. 1157 had been sugar-free for five days, but sugar came back when he had an important conference with one of his superintendents.

Wear warm clothes instead of staying by the radiator or in an overheated room. Wear light weight clothes, using several thicknesses if necessary. Heavy overcoats exhaust a diabetic. Men should appreciate the value of light weight clothes just as much as do women.

The change in the mental attitude of patients during the course of treatment is a gratifying encouragement to the physician. Untreated diabetics after a moderate number of years usually show depression, and with women this often becomes pronounced. In the first ten years of my experience with diabetes the tendency of such patients to cry impressed me greatly, but even then, with the methods in vogue, it was instructive to see how depression disappeared with the decrease or disappearance of sugar from the urine. When patients became sugar-free but developed acidosis, mental symptoms often improved and to so great an extent that one could say that with treatment, even though it did end in coma, the patient enjoyed life far more thoroughly than when untreated. During the last ten years the mental attitude of the patients has improved still more. The enthusiasm about new methods of treatment has been so great as to account partially for this, but the actual improvement in health which the patients have felt has been of more importance. Greeley explained to my patients how diabetes has largely been robbed of its terrors. He urged the simple life as a great aid in treatment and told them not to try to be first in the Iberian village and be ill, but rather to be second in Rome and keep well. He told them to have a hobby and not to make it a labor, to be cheerful, to keep their minds occupied, and, so far as possible, to continue the previous currents of their lives.

The art of learning how to get the most out of life under all circumstances must be cultivated by any patient. It takes time, thought, and practice to accommodate one's life to changed conditions, but it pays to study the problem.

CHAPTER VIII.

THE DIET OF NORMAL INDIVIDUALS.

Food and Fuel.—Foods are fuel for the body, just as gasoline is fuel (food) for an automobile. Man and automobile depend upon fuel as a source of energy. In case the gasoline gives out the automobile will stop, but if the food gives out the man will not immediately die, because he carries a good deal of the fuel stored up in his body, first and chiefly as fat, second, a lesser amount in the form of protein in the muscles and various tissues, and third, a little in the form of carbohydrate as animal starch (glycogen) and sugar in the liver, muscles, and blood.

A fasting man at the Carnegie Laboratory in Boston went without food for thirty-one days, living upon his reserve supply of food, in other words his own tissues.

Just as one can measure how much gasoline is required for an automobile to run 100 miles, so one can measure how much food is necessary for a man to live for twenty-four hours and do a given amount of work. Small automobiles require less gasoline than large automobiles, and this is pretty much true of individuals, for the food which they need depends upon their weight. There are exceptions. Children require proportionately more food, because they are growing, and old people require less, because they are quieter. If an adult behaves like a child in that he eats like a child, he will grow fat. How unfortunate there is no one to spank him and thus save him possibly from acquiring diabetes later! However, indigestion occasionally comes to the rescue and saves his life. Just as the automobile depends upon gasoline, oil, and water, the human automobile depends upon carbohydrate, protein, and fat, water, and various salts. If the food value of 1 gram of the foods, carbohydrate, protein,

and fat is known, and also the quantity of each food which is eaten, the total food value of the diet can be determined.

The nutritive value of the diet is readily computed by referring to Table 3, page 42, and by bearing in mind the caloric values of the various foods. (See page 33, Question 17). Table 4, page 44, will serve as an example.

Another method allows the food required by a given individual to be calculated far more accurately. By this method the total heat given off by a man at rest or at work is measured.

This total heat represents energy which has been derived from the oxidation of the three foodstuffs—carbohydrate, protein, and fat. It is unessential whether the foodstuffs oxidized have been taken within a few moments as food or whether they represent food deposited in the body as fat (fat tissue), protein (muscle tissue) or carbohydrate (glycogen *i. e.*, animal starch). Knowing the total heat given off it is not a difficult matter to calculate how much carbohydrate, protein and fat were required to produce it.

Experiments have demonstrated that the heat which is liberated in the body from the combustion of 1 gram of protein or of carbohydrate produces 4 calories, from 1 gram of fat, 9 calories and from 1 gram of alcohol, 7 calories. Fat, as would be expected, is more than twice as nourishing as carbohydrate or protein. With these figures in mind it is easy to estimate with sufficient exactness from dietetic tables the calories in the diet required to replace the heat given off by the body during the period of experiment. The result of such calculations is embodied in what follows:

The caloric needs of the body vary not only from day to day and hour to hour, but from moment to moment. The calories required by the average normal adult when at rest are about 25 per kilogram body weight. If the individual is sitting in a chair instead of lying on a couch 20 per cent more energy is required, though if the individual is in a semi-reclining position the need for calories is even less than when lying down. Too often in dietetic computations it is assumed that the caloric needs of the body can be accurately estimated. As a matter of fact, the error in such computations is con-

siderable, and it is absurd to expect to compute the needs of the individual when up and about, whether normal or diabetic, more closely than within 10 to 20 per cent of the real value. The reason for this is apparent if one observes the attitudes and motions of individuals in a street car. The one is quiet, the other restless, the one avoids exertion, the other is all activity. In disease these differences of habit and disposition are accentuated. One patient with 40 calories per kilogram body weight will gain pounds, the other will barely hold her own weight. A diabetic patient, Case No. 1541, confined to her bed with paralysis for a year remained sugar-free, held her weight constant and the diet, accurately weighed by a trained nurse for the entire period, amounted to 20 calories per kilogram body weight for twenty-four hours.

As an illustration of the amount of work which can be performed by 1 calorie of energy, I learn from my friend, Professor Benedict, that the expenditure of 1 calorie of heat is required to rise from a sitting position in front of a door, turn the key in the door, and sit down. A single 16-candle-power carbon lamp gives off in heat the equivalent of about 45 calories per hour, which represents a little less than the heat, basal metabolism, of an adult weighing 50 kilograms.

It is desirable for us all to visualize calories and to that end various concrete examples of what calories derived from food will enable an individual to do are given. To walk one hour on a level road at the rate of 2.7 miles an hour requires 160 calories above that of keeping quiet (Lusk). I suspect one will not err greatly if for each mile of walking one allows 1 calorie per 1 kilogram body weight.

A man of 60 kilograms walking up 10 flights of stairs, each flight 3 meters (10 feet) high, in three minutes would expend the heat equivalent of 26 calories or about 3 calories per flight. This would in effect double his basal metabolism.

The metabolism of a group of men standing was 12 per cent more than when in the horizontal position, according to H. M. Smith. He also found that walking at two miles an hour nearly doubled the standing requirement and at four miles an hour increased it three-fold. Farmers in various

parts of the United States have been shown to consume on an average 3500 calories.

Sewing and knitting require about 9 calories per hour more than that for the same subject sitting quietly in a chair, while washing, sweeping and scrubbing floors require 50 calories additional. Ironing and dish-washing each require about 25 calories additional. (Langworthy and Barott.)

TABLE 7.—CALORIES REQUIRED DURING TWENTY-FOUR HOURS BY AN ADULT WEIGHING 70 KILOGRAMS (154 POUNDS).

Condition.	Calories per kg. body weight.	Calories per pound body weight.	Total calories.
At rest	25–30	11–14	1750–2100
Light work	35–40	16–18	2450–2800
Moderate work	40–45	18–20	2800–3150
Hard work	45–60	20–27	3150–4200

Children require far more food than adults, because of growth and increased activity. This is shown in Table 8.

TABLE 8.—CALORIC NEEDS OF CHILDREN DURING TWENTY-FOUR HOURS.

Age, years.	Weight.		Calories per kg. body weight.	Calories per pound body weight.	Total calories.
	Kilograms.	Pounds.			
2	12	26	80	36	960
6	20	44	70	31	1400
12	36	80	50	23	1800

One is apt to conclude that an individual doing heavy work requires additional calories for the entire twenty-four hours. This is by no means true. With the cessation of work the metabolism falls abruptly. Furthermore, the actual period of heavy work is short and represented by minutes rather than hours. If of a pessimistic nature one has only to watch street laborers to be convinced, though a far more enjoyable and as scientific a proof is furnished by the minutes spent in actual play by the teams of football. In an entire game the minutes in which the ball was in play numbered 11, according to the stop-watch observations of the late Prof. Harold C. Ernst, and Mr. Robert Fisher tells me that in the

Boston College—Holy Cross game of 1922 the ball was in play eleven minutes and twenty-three seconds. Carpenter found 30 calories per hour additional were required by a typist writing at the rate of 50 words a minute compared with sitting still and reading. As age advances the metabolism requirements are lessened, thus if 1677 calories are required for basal metabolic needs at thirty years, 1542 are required at fifty and 1407 at seventy years of age.

Composition of the Normal Diet.—The ordinary diet for a man at moderate physical work would contain about 400 grams of carbohydrate, 100 grams of protein and 100 grams of fat. This would amount to 2900 calories in the twenty-four hours, or about 40 calories per kilogram for an individual weighing 70 kilograms (154 pounds). These figures would be proportionately reduced both for those of lower body weight and for those with lighter occupations who would require nearer 30 calories per kilogram.

TABLE 9.—THE CARBOHYDRATE, PROTEIN AND FAT IN THE DIET OF A MAN DOING MODERATE WORK, WEIGHT 70 KILOGRAMS (154 POUNDS).

Food.	Quantity, gm.	Calories, per gm.	Total calories.
Carbohydrate	400	4	1600
Protein	100	4	400
Fat	100	9	900
			2900

Chittenden, in his painstaking and scientific manner, accomplished an immense amount of good when he showed that people ordinarily consumed much more food than physiological needs demand. He suggests that it is more than probable that this excess of food is, in the long run, detrimental to health, weakening rather than strengthening the body and defeating the very object of nutrition.

From Table 9 it will be seen that more than one-half (55 per cent) of the energy of the diet of the normal individual consists of carbohydrate. These figures are only approximate, but they leave no doubt as to how large a place sugar and starch occupy in the daily ration.

The quantity of protein in the normal diet of an adult is decidedly less than 100 grams. From Cannon's investigations at the Harvard Medical School it would appear that hardworking medical students, with their regular activities, eat about 90 grams each day. There is little doubt but that it is safe for an individual to live upon 1 gram protein per day for each kilogram body weight, and a doctor's worry ends if his patients secure 60 grams protein, even though the students ate rather more. Protein is animal food to a large degree; hence its cost. This is an added reason for being sparing in the use of protein. There is also still another reason, because if an excess of protein is burned the other foods are also consumed more rapidly, and there is more chance for the heat so produced to go to waste.

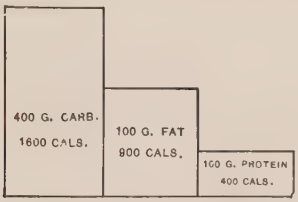


FIG. 7.—The relative caloric value of protein, carbohydrate and fat in a normal diet.

The quantity of fat in the normal diet varies partly from choice and partly from economic reasons. In general in those cases in which the carbohydrate in the diet is high the fat is low, and *vice versa*. The Voit standard placed the fat at 55 grams, but in a series of 1300 dietary studies of families, carried out among different races and in different countries, it was shown that the average quantity of fat eaten was about 135 grams (4.5 ounces) per person per day, the variation recorded being from 45 to 390 grams per person per day.

The more agreeable varieties of fat, such as butter, cream and oil, are expensive foods. Fat is also a concentrated food, not only because it has twice the caloric value of either carbohydrate or protein, but because it occurs more frequently in pure form. Oil, butter and lard contain little

water, whereas except for pure sugar and starch most carbohydrates and proteins are diluted 5 to 10 times with water.

The chief source of error in calculating the total caloric value of the diet, and especially of the diabetic diet, is in the estimation of fat. Anyone can realize this upon examining a piece of meat with its fringe of fat. The fat in bacon is most variable, and in amount its value can only be approximately estimated. Portions of bacon lose from 43 to 67 per cent of fat in the cooking. For this reason some physicians prefer to have the allowance of bacon for their patients weighed uncooked and then the fat which escapes in the process of cooking can be utilized in the preparation of their other food. As the proportion of protein to fat in different samples of bacon varies considerably the inconvenience of weighing the bacon uncooked has hardly seemed to me to counterbalance the questionable gain in accuracy. For this reason my patients weigh their bacon after it is cooked.

Eggs in some cities by law must weigh a pound and a half a dozen, an average of 60 grams (2 ounces) apiece. Such eggs contain approximately 6 grams of protein and 6 grams of fat. How gross our caloric reckonings are is obvious if a collection of eggs is weighed and the minimum and maximum weights noted. The weight of the heaviest egg in a collection of 56 eggs was 72 per cent more than that of the lightest. The 6 grams of protein are equally divided between the white and the yolk, but the 6 grams of fat are all in the yolk. When protein without fat is desired in the diet one whole egg and the whites of two others can be made into a dish of scrambled eggs. This would contain protein 12 grams and fat 6 grams.

The weight of one egg shell is usually about 7 grams.

Milk may be employed in the treatment of diabetes, but it must be prescribed and taken with care, because of the large quantity of carbohydrate, protein and fat which it contains. A glass of milk is drunk so easily that one is apt to forget that it contains 12 grams carbohydrate, 8 grams protein and 8 grams fat. Fig. 8, page 63, makes this clear. Skimmed milk and buttermilk contain the same quantity of carbohydrate and protein as whole milk, but differ from it in

the absence of fat. Thirty cubic centimeters (1 ounce) of skimmed milk, whole milk or buttermilk contain 1.5 grams of carbohydrate and 1 gram of protein, and 1 quart of skimmed milk contains approximately 48 grams carbohydrate and 32 grams protein. Whey contains 5 per cent carbohydrate, but practically no protein or fat. Cream and koumiss contain about 3 per cent carbohydrate, or 1 gram to the ounce. The Jewish sour cream contains about half as much.

Diabetic patients seldom become sugar-free on a milk diet. They may become sugar-free if so little milk is taken that they are partially fasting.

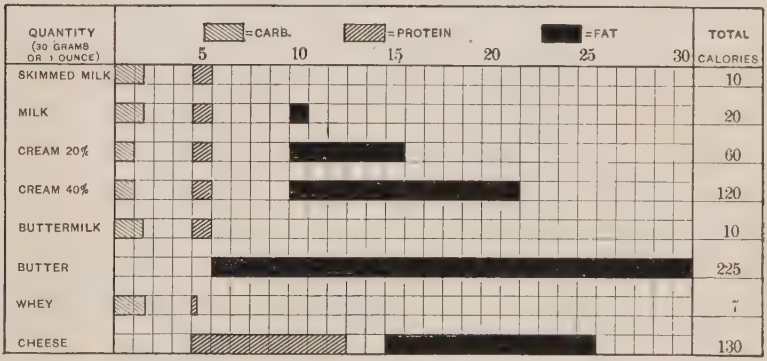


FIG. 8.—Milk and milk products. Carbohydrate, protein and fat in 30 grams, or 1 ounce. Each lineal division represents 1 gram.

The high nutritive value of cream, butter and cheese is evident from Fig. 8. This makes these special milk products desirable, but, if carelessly taken, danger of acid poisoning arises from the large amount of fat which they contain. The high protein value of milk—1 gram to the ounce, 32 grams to the quart—is important to consider, not alone because of the protein itself, but also because from protein sugar is often formed. Cheese contains about half again as much protein as fish.

Repeatedly physicians and patients have requested me

to arrange the common articles of the diabetic diet mentioned in Table 3 in terms of household measure. To a

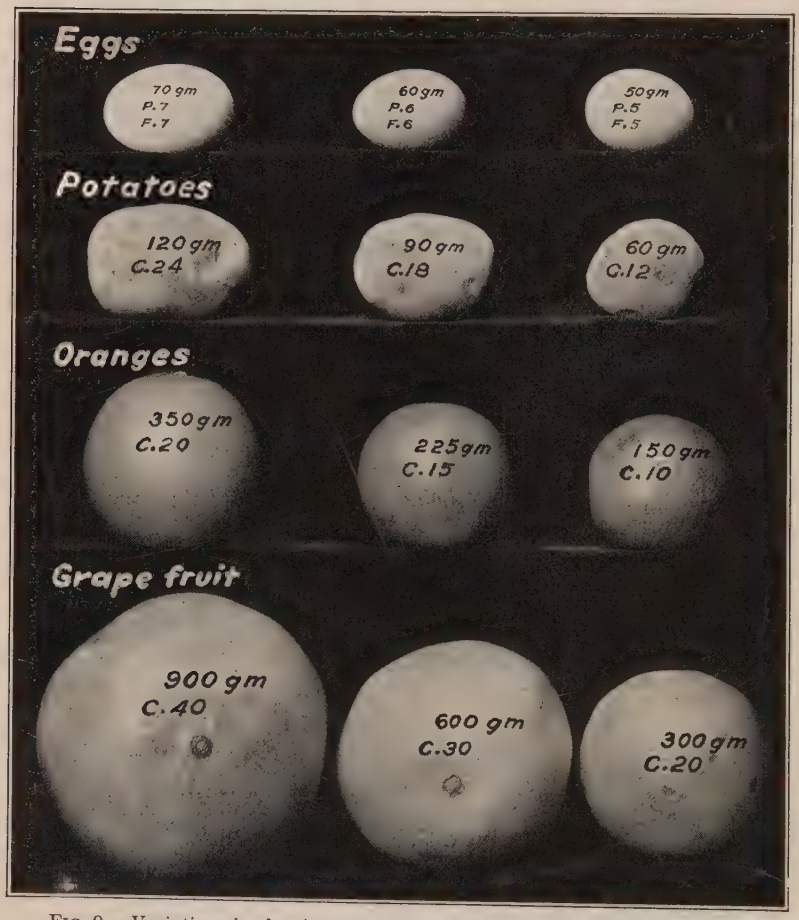


FIG. 9.—Variations in the sizes of common foods. The weights are gross weights. *C.* = carbohydrate; *P.* = protein; *F.* = fat.

considerable extent this is impracticable, because the diabetic diet deals with so small a quantity of carbohydrate. For

this reason the only safe way for diabetic patients at the commencement of their training is to weigh their food. After a few days of weighing, patients can select utensils from their own pantry or china-closet which conform to the size of the portions of their own special diets and use these exclusively. By this means needless weighing is avoided.

Patients and physicians often err in thinking their computations of the diet are extremely accurate. In order to demonstrate the errors which easily arise from general statements about foods, Fig. 9, page 64 is inserted.

It is manifestly inaccurate to allow one orange in lieu of 10 grams of carbohydrate, for, as the illustration shows, three oranges may contain respectively 10, 15 or 20 grams carbohydrate.

A similarly wide variation in carbohydrate content occurs in grapefruit. The oranges from left to right are sold under the trade names of 126, 170 and 250 (to the box) and the grapefruit under the trade names of 28, 64 and 96 (to the box). At the New England Deaconess and Corey Hill Hospitals, oranges and grapefruit are now prescribed according to the weight of the peeled pulp. Errors in eggs may compensate themselves, because the eggs average about 60 grams. Potatoes vary enormously in size, the diagram of the smallest shown here is in reality the size of an egg. It is quite unsafe to guess at the size of a potato.

It is partly on account of the ease with which large errors in the carbohydrate content of food may occur that it is desirable to give to patients with a low carbohydrate tolerance their carbohydrate in the form of 5 per cent vegetables exclusively, for an error in weight, reaching 120 grams (4 ounces) could not exceed 6 grams of carbohydrate.

CHAPTER IX.

THE DIET OF DIABETIC INDIVIDUALS.

The diet in health is made up chiefly of carbohydrate; the diet in diabetes is made up chiefly of fat. Both in health and diabetes it is desirable to keep the values for protein about the same. The task of the diabetic, therefore, is to learn how to live comfortably upon far less carbohydrate than that to which he has been accustomed and upon far more fat. The diet of the Eskimo formerly was not greatly unlike that of the diabetic today. It takes time and experience to live successfully upon a diabetic diet, because the body must adjust itself to the changed conditions. That it does so at all is indeed wonderful.

A comparison of the components of the normal and diabetic diets is given in Tables 10 and 11, and in Figs. 10, 11 and 12.

Table 10.—Normal and Diabetic Diets Compared. Adult Weighing 132 Pounds (60 Kilograms).

Food.	Comparison in grams.		Comparison in calories.	
	Normal.	Diabetic.	Normal.	Diabetic.
Carbohydrate	250	60	1000	240
Protein	60	60	240	240
Fat	60	130	540	1170
Total	...	...	1780	1650

The normal individual weighing 60 kilograms, 132 pounds, takes 250 grams carbohydrate, but the diabetic on the average only 60 grams. Each takes 60 grams of protein. To make up for the loss of carbohydrate, the diabetic increases

the fat of the normal diet which is only 60 grams to more than twice the quantity, namely 130 grams. Remembering that 1 gram of carbohydrate or protein produces 4 calories when it is burned in the body and that 1 gram of fat produces 9 calories, one can arrive at the figures in the right half of Table 11. Carbohydrate yields 1000 calories to the normal, but only 240 to the diabetic, the calories from protein are the same, but the 540 calories which the normal individual receives from fat are changed to 1170 in the diabetic. It will be noted that the total caloric value of the diabetic diet is slightly less than that of the normal diet. This is so arranged with design, partly because the diabetic patient needs less calories since he is less active and partly because an improvement of the diabetes is favored by the avoidance of any surplus food.

TABLE 11.—COMPARISON OF NORMAL AND DIABETIC DIETS IN ACTUAL FOODS.

Food.	Total food in grams.		Normal.				Diabetic.			
	Normal.	Diabetic.	C., gm.	P., gm.	F., gm.	Cal.	C., gm.	P., gm.	F., gm.	Cal.
5% vegetables	300	600	10	5	0	..	20	10	0	
Orange . .	200	200	20	0	0	..	20	0	0	
Oatmeal[1] . .	30	15	20	5	2	..	10	3	1	
Eggs . . .	1	2	0	6	6	..	0	12	12	
Cream . . .	. . .	240	..	..	..	..	8	8	48	
Bacon . . .	15	30	0	3	8	..	0	5	15	
Butter . . .	30	45	0	0	25	..	0	0	38	
Meat . . .	60	90	0	16	10	..	0	24	15	
Bread . . .	180	. . .	108	18	0					
Potato . .	120	. . .	24	4	0					
Milk . . .	240	. . .	12	8	8					
Banana . .	100	. . .	20	0	0					
Sugar . . .	30	. . .	30	0	0					
			244	65	59	1767	58	62	129	1641

Caloric Needs of the Diabetic.—The diet of the diabetic patient should contain, except for brief intervals, the minimum

[1] Weight dry 30 grams, if cooked 240 grams.

FIG. 10.—The normal diet. See Table 11 for size of portions.

	Milk		
Bread	Oranges	Bacon	Lettuce
Oatmeal	Potato	Meat	Asparagus
Sugar	Banana	Butter	Egg

FIG. 11.—The diabetic diet. See Table 11 for size of portions.

String beans	Cream	Bacon	Lettuce
Tomatoes	Oranges	Meat	Asparagus
	Oatmeal	Butter	Eggs

FIG. 12.—Diabetic breakfast, luncheon and dinner trays are not complete if helped out with washed bran biscuits and agar-agar jellies.

number of calories which the normal individual would require under similar conditions. Many normal individuals, in my opinion, actually live upon less than 30 calories per kilogram body weight, and repeatedly one sees diabetic patients over fifty years of age who comfortably live upon less for long periods. This is true only for the treated diabetic. If the patient is allowed more than the minimum amount of food there is far more likelihood that a portion will be unassimilated and appear as sugar in the urine. One of the first rules for the diabetic patient to learn is never to overeat. He should be a model in food conservation for his household. In pre-insulin days he always returned a clean plate because his appetite was equal to the food allowed. Insulin should make him no less cautious.

TABLE 12.—THE EFFECT OF THE RESTRICTION OF FOOD UPON DIABETIC MORTALITY.

	Berlin.	Munich.	Breslau.
1913	409	105	100
1914	467	104	115
1915	383	101	113
1916	331	82	78
1917	264	73	72
1918	177	77	51

The beneficial effects of a low diet upon diabetic patients were repeatedly observed in Germany during the years 1914 to 1918. This is well shown in a paper by Rosenfeld, of Breslau, from which Table 12 is constructed. Even in the United States the census reports for 1916 and 1917 show for almost the first time in a generation and a half a decline in the mounting death-rate from diabetes.

Carbohydrate in the Diabetic Diet.—The total carbohydrate in the diet of diabetic patients is almost invariably restricted, seldom exceeds 100 grams, and frequently is less than one-fifth of the normal carbohydrate ration. It so radically changes the composition of the normal diet as to make it self-evident that rapid changes from a normal to a diabetic diet containing even 100 grams carbohydrate might easily cause indigestion in normal as well as in diabetic individuals.

The lowering in carbohydrate must be compensated eventually by an increase in fat.

The Estimation of the Carbohydrate in the Diabetic Diet.—The quantity of carbohydrate in various foods is easily calculated and far more simply than is usually thought. (See Table 3, p. 42,with accompanying text.)

Carbohydrate in Vegetables.—It would appear time-consuming to determine the amount of carbohydrate in the various vegetables which the patient eats in twenty-four hours, and this is actually the case. Fortunately the content of carbohydrate in the 5 and 10 per cent groups of vegetables is so small that one is justified in the vast majority of cases in accepting an average figure for each group. It is true that there is considerable variation in the vegetables as classified in Table 2, but the average content in carbohydrate for all vegetables under one heading is not far from that represented, the error being in the assignment of too high rather than too low values. This does not hold for string beans, because trouble often occurs from the beans having developed into maturity, thus greatly increasing their content in carbohydrate. Many an unexplained trace of sugar in the urine has undoubtedly occurred in this way. "Refugee" beans are an excellent variety. "Kentucky Wonder" beans are also highly recommended for the garden, because they last so long. In the same way squash, summer squash, vegetable marrow and so on vary in composition according to maturity. Young vegetable marrow and young summer squash are safely included in the 3 per cent column, while mature fruit of any squash may be expected to run between 5 and 10 per cent.

One will not be very wrong if he considers the maximum amount of carbohydrate which a diabetic will secure from 5 per cent vegetables in the twenty-four hours as 20 grams. This is why in mild cases of diabetes it is unnecessary to weigh the vegetables, for it is improbable that a patient will eat too much of these. He is far more likely to eat an insufficient quantity. One must never forget that a diabetic likes to eat and that he can seldom eat anything less harmful than 5 per cent vegetables. Tactful wives always provide their

diabetic husbands not only with an abundance, but a wide variety, of these vegetables and take infinite pains to get the best and to prepare them with the utmost care. Even a moderately severe diabetic can partake very freely of these, and particularly is it the case when those selected are lettuce, cucumbers, spinach, asparagus, rhubarb, endive and vegetable marrow.

Loss of Carbohydrate in Cooking Vegetables.—Prior to the introduction of insulin it was frequently necessary to give very small quantities of carbohydrate to patients, because their tolerance was so low. It was then the custom to allow 5 per cent vegetables freely from which most of the carbohydrate was removed in their preparation. This is now unnecessary in all but the rarest instances. Foods of this type are free from carbohydrate and fat and contain a negligible amount of protein. Washed vegetables constitute a food of this type. Vegetables lose carbohydrate in the cooking, and this loss is favored (1) by changing 2 or 3 times the water in which they are prepared; (2) by preparing the vegetables in finely divided form so that the water can have easy access to the whole mass and thus dissolve out the carbohydrate.

Von Noorden pointed out that 100 grams of raw spinach contained 2.97 grams carbohydrate, but cooked spinach only 0.85 gram. Similarly 100 grams of ripe peaches contained 9.5 grams carbohydrate, but when boiled and the water changed, only 1.8 grams. Allen utilized this method of removing carbohydrate from vegetables, and allowed patients to have bulk in their diet. He termed vegetables so prepared "thrice-cooked" vegetables. "Under these conditions the vegetables may be boiled through three waters, throwing away all the water. Nearly all starch is thus removed. The most severe cases generally take these thrice-cooked vegetables gladly and without glycosuria." Patients often say that it makes little difference to them whether the vegetables are thrice washed or not. It is easy and useful to add a little salt, and if desired the vegetables can be flavored with meat juices or meat extracts. The vegetables which most readily part with their carbohydrates are spinach,

celery, and cabbage. Canned asparagus and canned spinach, carrots, and rhubarb should be washed 6 times. The carbohydrate in cauliflower is removed with great difficulty and this vegetable had best not be used for this purpose. Professor Wardall reports that three washings will remove the carbohydrate from beets and seven washings that from parsnips. Presumably this is due to the carbohydrate in these vegetables being more largely in the form of soluble sugar than in that of the relatively insoluble starch.

The Carbohydrate in Various Foods.—1. *Lettuce and Cabbage.*—Lettuce and cabbage are the most useful 5 per cent vegetables. Bulletin No. 28, Office of Experiment Stations, U. S. Department of Agriculture, gives 2.9 as the average percentage of carbohydrate in the former and 5.6 for the latter. By its bulk lettuce satisfies the appetite and is far more agreeable than the insipid washed vegetables. In fact, it has replaced these entirely at the New England Deaconess Hospital. When large quantities of a single vegetable, as, for example, lettuce, are employed, one must not depend on the group analysis. Cabbage is the poor man's 5 per cent vegetable. It can be eaten daily for months, raw and cooked, without repugnance. Its composition is so constant that the amount tolerated can readily be determined. Case No. 866 was sugar-free at the hospital with difficulty and in the course of eight months the lowest blood sugar was 0.13 per cent. When he went to sea on a lumber schooner and lived almost exclusively on cabbage for his vegetable, he returned after one month not only without glycosuria but with a blood sugar of 0.1 per cent. In the spring of 1922, he went to sea again, returning to the hospital in October with no glycosuria and with a blood sugar of 0.12 per cent.

2. *Potatoes.*—The variation in the percentage of carbohydrate in potatoes before and after cooking is negligible, save with potato chips, in which on account of the loss of water in their preparation the carbohydrate is more than doubled. Emphasis should be laid upon the comparatively small amount of carbohydrate in potato in proportion to its bulk in comparison with the large percentage of carbohydrate

in bread. A considerable number of my milder cases of diabetes, by giving up bread and bread preparations entirely, have been able to eat potatoes freely. In prescribing potatoes for diabetic patients it is desirable to designate baked potatoes. These can be eaten agreeably together with the skins when they have been carefully cleaned with a scrubbing brush in the kitchen. Baked potatoes are advantageous in two ways: the skins are quite an addition to the meagre diet of the diabetic, and they counteract constipation.

3. *Nuts.* –Nuts containing 15 and 20 per cent carbohydrate are probably far less objectionable than most other foods with a similar carbohydrate content. This is due to the fact that in such nuts as almonds and peanuts a larger part of the carbohydrate is in the form of pentosan, galactan or other hemicelluloses, which probably do not readily form sugar. There is a field for investigation open here. On the other hand, nuts are dangerous for a diabetic unless allowance is made for the considerable quantity of protein and the very large quantity of fat which they contain. One ounce of castanas (Brazil nuts) represents about six nuts in which there are carbohydrate 2 grams, protein 5 grams, and fat 20 grams, or 210 calories! Ignorant diabetics often eat nuts as freely as they would 5 per cent vegetables and wonder why they develop glycosuria and acidosis. Case No. 1930, quite mild when her treatment was inaugurated, went home, ate nuts about as freely as some 5 per cent vegetables, and escaped diabetic coma, but only through severe undernutrition from which a special nurse and insulin have rescued her.

4. *Fruit.*—Fruit is most desirable for a diabetic patient if his tolerance will allow him to take it. The taste is agreeable, it serves instead of a dessert, and so relieves the patient of the embarrassment of sitting idly at the table when others are eating. The best varieties of fruit for diabetic patients are grapefruit, which I generally reckon as containing 5 per cent of carbohydrate, strawberries (6 per cent), and oranges (11 per cent). As a rule patients can take twice as much grapefruit as orange with impunity. These fruits are safer for the patient than apples (13 per cent), because they contain 5 to 10 per cent less carbohydrate and are more satisfy-

ing. Furthermore, it is less easy thoughtlessly to eat an orange than an apple and thus break dietetic restrictions. To a diabetic an apple is devoid of skin, seeds and core. A small apple contains one tablespoonful of sugar and a large apple three tablespoonfuls. I never have any success in allowing apples to diabetics. Hence all the children reply in answer to the question "What should a diabetic do with an apple?" "Give it away."

At present my patients use the following equivalents in their choice of fruits as representing 10 grams carbohydrate (Table 13). The values are approximate.

TABLE 13.—EQUIVALENTS OF 10 GRAMS CARBOHYDRATE IN VARIOUS FRUITS.

	Grams.
Orange pulp	100
Grapefruit pulp	200
Strawberries	150
Blackberries	100
Raspberries	75
Peaches	75
Blueberries	65
Banana	50

5. The quantity of carbohydrate in a *very small* orange is about 10 grams. The same statement will apply to one-half a small-sized grapefruit. One will not be far wrong to consider that one compartment of a very small orange contains 1 gram carbohydrate. The illustration on page 64 shows that larger oranges and larger grapefruit easily contain twice as much carbohydrate as do the smaller varieties.

6. *Bananas.*—That today a considerable number of diabetics can have one-half of a banana or even a whole banana is mute witness to the advances in treatment during the last few years as a result of diet and insulin. Bananas have this advantage over grapefruit, oranges, and especially apples and potatoes, because they are more uniform in size. The average banana weighs 100 grams and hence contains 20 grams carbohydrate. This is the same amount as is contained in 1 ounce, 30 grams, of dry oatmeal or four Uneeda biscuits.

In general the riper a banana, and for that matter any vegetable or fruit, the more of the starch in it has changed

FIG. 13.—An apple is dangerous for a diabetic. The sugar in a large apple amounts to as much as the starch in a large roll or the sugar and starch in two bananas or in seven portions of cabbage, celery, asparagus, lettuce, tomato, spinach and string beans.

to sugar; and also the more carbohydrate it contains. Since unripened fruits with their lower carbohydrate content can be made palatable by cooking, a way is afforded for diabetic patients to use them.

7. *Ripe Olives.*—Ripe olives make a pleasing change in the diet. They contain 4 per cent carbohydrate in contrast to green olives, which contain 1.6 per cent. Furthermore, ripe olives are more easily digested. Five ripe or 10 green olives contain 1 gram carbohydrate and 5 grams fat. The quantity of protein in 10 olives is about 1 gram.

8. *Distilled Vinegar.*—Distilled vinegar contains no protein, fat, or sugar, because it is made from a dilute alcoholic distillate. Cider, wine, malt and sugar vinegars are made of fermented juices, infusions, or solutions, *not distilled*, and may contain small amounts of sugar, etc. For analyses of vinegar, see page 177.

9. *Milk.*—The carbohydrate in milk is in the form of lactose and can be reckoned at 5 per cent, or 1.5 grams per 30 cc, or 1 ounce. It is the same in skimmed milk, buttermilk, and whey; but cream and koumiss contain about 3 per cent, or 1 gram carbohydrate to the ounce. Buttermilk contains essentially the same quantity of carbohydrate and protein as milk, but only a trifling amount of fat. Fermented milk may contain 3 per cent sugar. I could not understand for years why doctors so frequently gave milk to their patients, but the reason is plain. A milk diet represents undernutrition, and the physician who prescribed skimmed milk or buttermilk exclusively for his mild diabetic patient was employing a modern therapeutic agent.

One quart of milk contains about 660 calories, of skimmed milk 370 calories, of cream with 20 per cent butter fat 2000 calories, and of 40 per cent cream 3700 calories. Milk contains so many desirable food elements that it is always beneficial to insert some of it as milk or cream into the diet.

10. *Oatmeal.*—Oatmeal is two-thirds carbohydrate. In calculations one should be guided always by the dry weight, because the different preparations vary greatly in bulk and weight when cooked. It is a simple matter for a few days to weigh out 30 grams (1 ounce) of dry oatmeal, containing 20 grams carbohydrate, have it cooked and note the bulk.

By dividing the oatmeal thus cooked into four portions each would contain 5 grams carbohydrate.

In weighing foods with the usual variety of scales one should never attempt to weigh out quantities as small as 5 grams. A more reliable result is obtained by weighing out multiples of 5 grams and then dividing into enough portions to make each portion 5 grams.

A shredded wheat biscuit, weight 30 grams, can be used interchangeably with 30 grams of oatmeal. Its uniform size and its availability at all times make it an extremely convenient article of food for a diabetic patient.

11. *Bread.*—Bread is an aggravation to a diabetic, because he can tolerate so little without showing glycosuria unless his tolerance is notably high. An error of 1 ounce in the weight of 5 per cent vegetables amounts to 1 gram carbohydrate, of potato to 6 grams, but of bread to 18 grams. The carbohydrate in white wheat bread amounts to about 53 per cent. If the bread is toasted, enough water is lost to raise the percentage of carbohydrate in the toast to about 60. If the bread is made without sugar and with water instead of milk, the carbohydrate content is lowered and may amount only to 45 per cent. Coarse breads if made without sweetening or milk would contain slightly less carbohydrate. If the tolerance for carbohydrate is less than 100 grams, breads are best avoided.

Crackers and zwieback contain still less water than toast, and in consequence the percentage of carbohydrate is raised to the neighborhood of 70 per cent. Many gluten breads upon the market contain as much as 30 per cent carbohydrate. The black Jewish bread contains about 40 per cent carbohydrate (page 172)[1].

Protein in the Diabetic Diet.—The quantity of protein required by diabetic patients varies with the age, weight and activity of the case as well as with the condition of the kidneys. It is a safe rule at the beginning of treatment to attempt to increase the protein gradually up to the same quantity as that required by a normal individual. This is

[1] I understand the analysis given on page 172 was made on bread which had lost moisture and the calculated figure "about 40 per cent" is more nearly correct.

approximately 1.0 to 1.5 grams per kilogram body weight for adults, but for children it may reach 3 grams.

Chittenden points out that 60 grams (one-half the old standard protein) are quite sufficient to meet all the real physiological needs of the body under ordinary conditions of life, and that with most individuals not leading an active outdoor life even smaller amounts will suffice. Chittenden, weighing 57 kilograms, and Mendel weighing 70 kilograms, lived respectively on 34 and 41 grams protein daily, the former for nine and the latter for seven months. Until the Chittenden low protein diet is proved to be entirely satisfactory as a permanent diet for healthy individuals it is best not to have recourse to it for long periods in the treatment of diabetes. Temporarily small quantities may be given, but safety lies not far from 1 gram protein to each kilogram body weight.

In the arrangement of the diets of severe diabetics the protein must be restricted to less than 1 gram per kilogram body weight in order to increase carbohydrate and particularly fat without the danger of acidosis. Protein stimulates the metabolism more than any other kind of food, favors acidosis, and can lead to the formation of 58 grams of glucose for every 100 grams protein metabolized.

It has been claimed that vegetable proteins give rise to less carbohydrate than do animal proteins. As a matter of fact, carbohydrate may be formed out of any protein.

Meat and Fish.—These two articles constitute the chief sources of protein in the diabetic diet. The study of the chemical composition of these foods is simplified for the diabetic patient by the fact that carbohydrate is absent, except in liver and shell-fish. Even in liver the quantity of carbohydrate is almost negligible when we consider the amount and frequency with which this article of food is eaten. The analyses of liver and shell-fish will be found in the tables on pages 166, 169.

The chief difficulty in computing the nutritive value of meat and fish is due to the varying content of fat. Thus, the edible portion of chicken may contain on the average only 2.5 per cent of fat, whereas lean ham may contain 14

per cent of fat, fat ham as much as 50 per cent and smoked bacon 65 per cent, though lean smoked bacon 42 per cent. In general a mixture of cooked lean meats probably contains not far from 10 to 15 per cent of fat.

Fish differs from meat chiefly in the small quantity of fat. Even salmon, which contains more fat than most other fish, showed in its analysis only 12.8 per cent fat, shad 9.5 per cent, and herring and mackerel 7.1 per cent. In general other kinds of fish show 6 per cent or less of fat. Halibut steak, for example, contains 5.2 per cent and cod 0.4 per cent. Preserved fish, however, is quite rich in fat; thus sardines contain 19.7 per cent. In substituting fish for meat, my patients are taught to add from $\frac{1}{2}$ to 1 teaspoonful of olive oil to the diet for each 30 grams of fish. One egg and 30 grams of sardines are convenient equivalents.

The quantity of protein in meat also varies considerably and usually falls as the percentage of fat rises. A value of 20 per cent for protein in uncooked lean meat represents about the average, and this is increased to 25 per cent or more when the meat is cooked. The quantity of protein in fish is very slightly less than that in meat. Shell-fish make agreeable additions to the diet: (1) They are desirable because they are palatable; (2) they are bulky foods and so are satisfying; (3) they furnish a separate course at a meal. Half a dozen oysters or clams are quite sufficient. The edible portion of a medium-sized oyster on the shell weighs on the average half an ounce, and half a dozen oysters would amount to about 100 grams. The six would contain about 4 grams carbohydrate, 6 grams protein and 1 gram fat, the equivalent of 50 calories. Half a dozen clams on the shell (edible portion) weigh 35 grams and contain 0.7 gram carbohydrate, 3 grams protein and a negligible quantity of fat.

Eggs.—Next to meat and fish, eggs are the most frequent source of protein for the diabetic. (These have already been discussed on page 62.)

Cheese. Cheese is a prolific source of protein and is to be recommended because of its lesser cost. A gram of protein in cheese is considerably less expensive than a gram of protein in the form of meat, fish or eggs. Most varieties of cheese

upon the market contain large percentages of fat. Even skimmed-milk cheese may contain as much as 15 per cent. The percentage of protein varies from 18.7 per cent in Neufchatel cheese to 37.1 per cent in Dutch cheese, while the fat varies from 1 per cent in cottage cheese to 38.3 per cent in red American and to 38.9 per cent in Dutch cheese. Therefore, one must not be oblivious of the variety of cheese when eating an ounce of the same.

Broths.—Broths are so extensively used for diabetic patients that their composition deserves notice. Jelly-like broth contains a large quantity of protein in the form of gelatin, and such broths may prevent diabetic patients from rapidly becoming sugar-free when they are consumed freely. As a rule, the nutritive value of a broth made for diabetic patients should be negligible. That this may be the case the broth should be skimmed free of fat and obviously should be clear so as to be free from particles of meat fiber. Various canned bouillons and bouillon cubes contain very little nourishment. (See page 172.) Another danger in broths lies in the amount of salt which they contain. Frequently this is very great, whereas the amount of salt should be moderate. Patients often desire to drink several cups of broth a day, and if the broth is heavily salted a portion of the salt may not be excreted. Each teaspoonful of salt that remains in the body holds back with it approximately 1 pint of water. This frequently causes temporary swelling of the lower extremities and face, a condition which usually is more annoying than dangerous.

Considerable variety can be obtained in the broths suitable for patients. These are described on page 171.

Fat in the Diabetic Diet.—Fat forms the greater portion of the calories of the diabetic patient's diet. Even with the most modern ideas upon treatment this statement holds. Table 10 gives the proportions which the different foodstuffs hold in the diet and shows the extent to which diabetic patients must depend upon fat to offset the loss of carbohydrate. Remember that the diet of a healthy individual of 60 kilograms (154 pounds) at office work contains approximately 250 grams of carbohydrate, yielding (250 x 4) 1000

calories. A diabetic patient of analogous weight who fails to utilize more than 240 of these 1000 carbohydrate calories must replace the remaining 760 calories with 85 grams of fat. Theoretically this should be taken in addition to the usual 60 grams of fat in the normal ration, but practically this is seldom necessary, because the diabetic patient is usually less active than the ordinary individual.

How much fat should a diabetic patient eat? This does not depend upon the capacity of the digestion. The safest answer would be: as little as possible above the normal quantity in order to maintain body weight. Unquestionably the quantity will vary from time to time, and it may increase with years without detriment to the patient. Nevertheless, it is reassuring to see a diet which contains more grams of carbohydrate than grams of fat. In other words, a carbohydrate-fat ratio of 2 to 1 or 1 to 1 begets confidence, and a carbohydrate-fat ratio of 1 to 5 or above causes apprehension. Yet Case No. 664, with diabetes of fifteen years' duration, lives upon a diet which contains twice as much fat as carbohydrate, and for years the ratio was nearer 1 to 4 or even 1 to 5. The quantity of fat should never exceed 3 grams of fat for 1 gram of carbohydrate unless the urine is at the same time sugar-free and unless the protein is reduced to $\frac{2}{3}$ gram (0.66 gram) per kilogram body weight.

Fat is most agreeably taken as cream, and cream which contains 20 per cent butter fat is usually easier to bear than a richer cream. The upper 120 cc (4 ounces) of a quart bottle of milk which has stood for twenty-four hours is 20 per cent cream. Cream bought at the market as medium cream contains about 25 per cent butter fat. It is seldom advisable to allow more than half a pint (240 cc) of cream, although patients prefer to increase the quantity of cream at the expense of other forms of fat in the diet. Half a pint of 20 per cent cream contains 48 grams of fat, and yet the quantity of carbohydrate or of protein in cream of this richness is but little over 8 grams and may be estimated in clinical work as 8 grams, or 1 gram to the ounce. A simple method of increasing the amount of fat allowed the patient is to substitute heavy cream for the medium cream. In this

way the fat is about doubled. In this vicinity standard heavy cream contains 48 per cent fat. Occasionally patients tolerate butter better than cream and, as a rule, fresh, unsalted butter is preferred. Thirty grams of butter contain 25 grams of fat, and this is a welcome addition to the diet. Oleo, butterine and nut margarine contain no sugar and have about the same percentage of fat as butter, and the cost is very much less. Lard being nearly 100 per cent fat can be used to advantage more than it is now in the diabetic's diet. Crisco, also nearly 100 per cent fat, is often more welcome than lard, because of the lack of flavor. Oil is 100 per cent fat.

Oil is so desirable for a diabetic that it is inadvisable for a patient to take more than 15 grams (1 tablespoonful), lest he weary of the same. If oil is disliked upon vegetables, it can be taken in small quantities as medicine after meals. Italian patients naturally bear olive oil unusually well. Olive oil forms an excellent lunch for diabetic patients. It may be used upon retiring. It is the diabetic patient's cough medicine and relieves the symptoms of his hyperacid stomach. Peanut, corn or cotton-seed oil may be substituted if expense is a factor. Mineral oil is without nutritive value. One of my patients by error took large doses of olive oil thinking it to be mineral oil and serious symptoms resulted from the surplus food.

Danger of Fat to the Diabetic.—Fat is the chief source of the dreaded acidosis, though to this in some degree protein contributes as well. Fat, therefore, at one time may preserve the life of the diabetic, because of its high nutritive value, but at another period may destroy it by causing acid poisoning. How needless this is the statistics of the New England Deaconess Hospital and the Leatherbee Diabetic Home across the street show. In these two places during 1923 there were treated by various physicians over 800 cases of diabetes with two deaths from acid poisoning, diabetic coma, and these occurred within eight hours of the admission of the patients. Fat in the diabetic diet when properly balanced with carbohydrate and protein is harmless.

Alcohol.—Alcohol does not contain carbohydrate, but the oxidation of 1 gram in the body gives rise to 7 calories. If enough alcohol is taken to make the diet above the caloric needs, sugar appears in the urine as it would after an excess of carbohydrate, protein, or fat.

Theoretically alcohol might appear indicated in diabetes, but practically patients do better without it. One of the reasons why neuritis is far less common among diabetics here than in certain foreign countries is, I believe, largely due to the smaller amount of alcohol consumed. Furthermore, I think it far easier for a diabetic to exercise self-restraint without the use of alcohol than with it. It is certainly not needed in the diabetic dietary.

The pleasure which comes from the practice of medicine has increased materially since the restriction of the use of alcohol in the community and, despite allegations to the contrary, I believe the amount of alcohol consumed is decreasing.

Liquids.—It is rarely necessary to restrict the liquids in diabetes. The diminution of the carbohydrate in the diet with the resulting fall in the quantity of the sugar to be excreted usually leads to a corresponding diminution in thirst and in the volume of urine. A doctor hesitates to restrict a patient with severe diabetes in the use of liquids for fear too little fluid will be available for the body with which to eliminate the acids which may have been formed. On the other hand, patients often upset the digestion by drinking large quantities of liquids rapidly. This is avoided by allowing only half a glass of water at a time, though the patient is instructed to take that as frequently as desired.

Case No. 1196 continually voided large quantities of urine, but investigation usually revealed a cause, such as the ingestion of 20 or more grams of salt, bouillon cubes in variable number or 21 half-grain saccharin tablets a day. Ice water should be discouraged; it may not upset the digestion always, but it does invariably call for the expenditure of calories to warm it to blood heat, and calories for such a purpose a diabetic cannot well spare.

Sodium Chloride.—Salt is of great service to the diabetic patient. If it is withdrawn from the diet the weight falls, due to the simultaneous excretion of water, and the skin and tissues of the patient are obviously dry.

In the early days of fasting and rigid undernutrition, patients often lost much weight because water alone was allowed. For example, one case lost 13 pounds in four days in this manner. When broths are freely given during fasting it is not uncommon, particularly in the presence of acidosis, to see a patient gain weight, and invariably such patients feel better than those who lose.

This gain in weight is to be explained by the large quantity of salt in the broths. Salt is very freely used by diabetic patients. I do not remember to have ever seen a diabetic patient who took too little salt, though such a case has been called to my attention at another clinic. One of my fasting cases was accustomed to shake salt into his hand to eat. Patients will often salt their broths, although these frequently already contain too much.

The fact that it is harmful for a diabetic patient to take large quantities of salt is occasionally shown by the excessive quantities of urine which they are obliged to void, though sugar-free, and by the swelling in legs and ankles which may appear. However, it should be stated that it is most exceptional for a patient with dropsy to develop diabetic coma, and I recall but one instance of a patient in diabetic coma in whom dropsy appeared. The withdrawal of salt from the diet of Case No. 1378 wrought surprising changes in her weight and her dropsy entirely disappeared. From 98 pounds it fell to 70 pounds in twenty-five days, and this was due almost exclusively to the disappearance of the dropsy. If the quantity of the urine in twenty-four hours does not exceed 1500 cc (3 pints) the amount of salt in the diet is seldom, if ever, too great.

CHAPTER X.

THE TREATMENT OF DIABETES WITH DIET AND INSULIN.

Introduction.—The purpose of the dietetic treatment of diabetes is to enable the patient by the rearrangement of his diet to lead a useful life. He may be urged to live less strenuously, but he can at least live in a manner similar to that of a healthy individual. This object is best obtained by preventing the loss of sugar in the urine, in other words, by keeping the urine sugar-free.

It is explained to the patient that whereas the sugar in the urine is chiefly dependent upon the sugar and starch in the diet, the simple reduction of the total quantity of the diet may result in its elimination; that this reduction of the total caloric value of the diet is effected best by the reduction of carbohydrate, next of protein and least of fat; that in order to determine how much of the diet is unassimilated and appears in the urine, certain articles of food should be selected whose composition is simple and well known; that the quantities of these foods taken in each twenty-four hours should be weighed or measured; that the facts so obtained should be reported to the physician; and finally, in order to show the result of the dietetic restriction, the sugar in the twenty-four-hour amount of urine should be determined and compared with the carbohydrate intake.

Until recently the urine furnished the best guide to the physician as to whether the patient was upon a proper diet. Today the examination of the blood affords information which is of additional and, in some respects, of superior value. If the sugar in the blood can be maintained in the neighborhood of the normal quantity (0.1 per cent), sugar does not appear in the urine save in exceptional cases.

Usually sugar is not found in the urine until the blood sugar is increased to 0.17 per cent. Therefore, abnormalities are apparent in the blood earlier than in the urine, and consequently if a patient has a normal blood sugar he knows he is in a safer condition than when he is informed that the urine is sugar-free. However, the knowledge of the blood sugar is recent and too categorical statements should not be made.

The discovery of insulin has accelerated dietetic treatment and at the same time made it less strenuous. Whereas formerly about two weeks were required to enable the patient to become free from sugar and attain an appropriate and satisfactory diet one now requires barely ten days. Indeed, if the saving of time is urgent, the entire procedure can be accomplished in a single day. Treatment is less strenuous, because insulin aids the assimilation of carbohydrate and as a consequence it need not be reduced to so great an extent. This utilization of carbohydrate by the body is of great importance, because for every gram of carbohydrate so utilized it is safe to give several grams of fat, which even gram for gram, is more than twice as nourishing. Insulin saves both time and weight for the patient and easily more than pays for itself. For this reason it is often used temporarily with cases who could get along without it. This is particularly true of patients past fifty years of age.

Treatment of mild cases of diabetes, like the treatment of all types of diabetes, can be carried out in various ways. There is no hard and fast rule. One of the simplest procedures, as suggested above, is to decrease the total quantity of the diet, irrespective of its quality, to such a point as will bring about a slight loss of weight. Occasionally this is all that is necessary to free the urine from sugar. This is the explanation of the "milk cure" and "potato cure" of former times. Those exclusive diets were undernutrition diets. More commonly, however, impatience on the part of the doctor and patient defeats such a plan and the urine is first rendered sugar-free by the omission of such carbohydrate foods from the diet as sugar, sweetened desserts, bread, and potato. While this treatment may work well in some cases,

it leaves too much to chance to be successful in all. In certain instances it may even be harmful, because the omission of so much carbohydrate from the diet without simultaneous omission of fat may lead to acid poisoning, and acid poisoning is a serious handicap to a diabetic patient. The mere development of acid poisoning transfers the individual, at least temporarily, from the mild to one of the severe types of the disease. It is for these reasons that the following rather more detailed plan of dietetic treatment is recommended. No apology is offered for the added work entailed upon both doctor and patient, because during these first few days of treatment, foundations are being laid upon which years of usefulness and comfort can rest.

The dietetic treatment of the average diabetic is extraordinarily simple. Overeating has brought on the disease; undereating will dispell most of the symptoms. Then and not until then should the diet given be increased to an amount which will enable the individual to lead a useful life.

The general procedure in the treatment of a case, therefore, is to begin with a reduction of the total diet by about one-half. If this does not result in making the urine sugar-free, upon the second day approximately one-third of the normal diet is given, and, if this does not avail, upon the third day the total calories in the diet are reduced to one-fourth the normal diet, this restriction largely taking place in the carbohydrate portion. In Table 14 the method is shown by which this gradual reduction of the diet in three successive days is made.

TABLE 14.—NORMAL AND TEST DIETS.

	Carbohydrate, gm.	Protein, gm.	Fat, gm.	Calories.
Normal diet	250	60	60	1780
Test diet 1	101	35	43	931
Test diet 2	66	24	37	693
Test diet 3	34	15	30	466

The first line of Table 14 gives the normal diet already discussed on page 66. This consists of carbohydrate 250 grams, protein 60 grams, and fat 60 grams, calories 1780.

Test Diet 1 for the first day of treatment shows a reduc-

tion of approximately one-half in calories. The reduction takes place more in the form of carbohydrate than in protein and fat. On the second day still less carbohydrate and protein are given, but the fat is very slightly reduced, while upon the third day the carbohydrate is hardly more than one-tenth of that of the normal diet, the protein one-quarter, and the fat one-half.

The great majority of diabetic patients will become sugar-free if they follow the reductions in diet here prescribed.

TABLE 15.—COMPOSITION OF TEST DIETS.

Diets.	Total diet.				Carbohydrate (C).					Protein and fat (PF).	
	Carbohydrate.	Protein.	Fat.	Calories.	5 per cent vegetables.	Orange.	Shredded wheat.	Uneeda.	Potato.	Egg.	Cream 20 per cent fat.
T.D. 1 . .	101	35	43	931	300	300	1	2	120	3	120
T.D. 2 . .	66	24	37	693	300	300	½	2	...	2	120
T.D. 3 . .	34	15	30	466	300	200	..	..	...	1	120

The foods which compose the three test diets are shown in Table 15. In the left hand column are found the test diets numbered 1, 2, 3, and in the neighboring four columns the carbohydrate, protein, fat, and calories which they contain. The carbohydrate portion of a given test diet is made up largely of the foods itemized in the section of the table adjoining on the right. It will be seen that for Test Diet 1 (T.D. 1) the 5 per cent vegetables amount to 300 grams, orange 300 grams, shredded wheat 1, Uneeda biscuits 2, potato 120 grams. Still further to the right are the protein and fat components of the diets, consisting of eggs 3, and cream 120 cc or 4 ounces. These special foods were selected for the first test diet because they are not apt to upset the stomach, are easy to obtain, and even if scales are unobtainable can be described in portions. Three hundred grams of vegetables would be 2 large saucerfuls. Three hundred grams

orange would be 3 oranges of small size. One shredded wheat biscuit and 1 Uneeda need no further description, and from Table 3 on page 42 are shown to contain 23 grams and 5 grams of carbohydrate respectively. Potato is somewhat doubtfully measured, but 120 grams is a medium-sized potato and about the size of 2 eggs. Eggs cause no difficulty to digestion or measurement and the 120 cc of cream are simply 1 quarter of a pint. The computation of Test Diet 3 is given in Table 16.

TABLE 16.—COMPOSITION OF TEST DIET 3, (T.D.3).

(See Table 3, page 42)

	Gm.	Carbohydrate.	Protein.	Fat.	
5 per cent vegetables	300	10	5	0	
Orange	200	20	0	0	
Egg	1	0	6	6	
20 per cent cream	120	4	4	24	
		34	15	30	Calories 466

Progression through these three Test Diets does not suffice to render the severe cases of diabetes sugar-free. This could be accomplished, if insulin were unavailable, by giving a somewhat lower quantity of carbohydrate and a comparatively small number of calories for a few days more. For this purpose the so-called Maintenance Diets have been arranged and, because the quantities of carbohydrate and protein and fat in these diets will seldom be prescribed exactly according to schedule, the carbohydrate portion of the diet for a given day holds the name of C_1, C_2, C_3, etc., and the protein fat portion of the diet for the same day PF_1, PF_2, PF_3, etc. Thus it is easy to prescribe carbohydrate for the sixth day C_6 and protein fat for the eighth day PF_8. Should more cream be desired in the diet one could simply raise the 120 cc of cream which appears in PF_8 to 180 cc or 240 cc and similarly if still more fat is indicated the butter can be increased from 30 to 45 grams. See Table 17, page 92.

It will be observed that each line and number of the Maintenance Diets represents an addition of about 10 grams of carbohydrate until C_{11} is reached. Here there is an increase

TABLE 17.—INSULIN DIABETIC DIETS.[1]

	Diets.	Total diet.				Carbohydrate (C).						Protein and fat (PF).					
		Carbohydrate.	Protein.	Fat.	Calories.	5% vegetables.	Orange.	Oatmeal.	Shredded wheat.	Uneeda.	Potato.	Egg.	Cream 20% fat.	Bacon.	Butter.	Meat.	
Test	T.D. 1	101	35	43	931	300	300	..	1	2	120	3	120	..	..	...	1
	T.D. 2	66	24	37	693	300	300	..	½	2	...	2	120	..	..	...	2
	T.D. 3	34	15	30	466	300	200	..	..	..	...	1	120	..	..	...	3
Maintenance	C1+PF1	14	15	30	386	300	...	..	..	..	...	1	120	..	..	...	1
	C2+PF2	22	19	37	497	300	100	..	..	..	...	2	60	..	15	...	2
	C3+PF3	32	24	37	557	600	100	..	..	..	...	2	60	..	15	...	3
	C4+PF4	42	29	52	752	600	200	..	..	..	...	2	60	30	15	...	4
	C5+PF5	52	32	66	930	600	200	15	..	..	...	2	60	30	30	...	5
	C6+PF6	64	44	83	1179	600	200	30	..	..	...	2	120	30	30	30	6
	C7+PF7	74	52	88	1296	600	300	30	..	..	...	2	120	30	30	60	7
	C8+PF8	84	61	94	1426	600	300	30	..	2	...	2	120	30	30	90	8
	C9+PF9	98	65	106	1606	600	300	30	½	2	...	2	180	30	30	90	9
	C10+PF10	109	66	119	1771	600	300	30	1	2	...	2	180	30	45	90	10
	C11+PF11	135	80	135	2075	600	300	30	1	2	120	2	240	30	45	120	11
	C12+PF12	159	84	135	2187	600	300	30	1	2	240	2	240	30	45	120	12

[1] For basis of computation of food values, see Table 3, page 42.

of 24 grams. To accomplish this increase potato is added to the menu, and it is felt that if the patient cannot tolerate 120 grams of this, he had best leave it alone.

The form in which the patient takes his carbohydrate makes no difference theoretically, but it makes a great deal of difference practically. If he cannot tolerate 100 grams carbohydrate he should not attempt 20 per cent vegetables, and if he cannot tolerate 150 grams carbohydrate, he should not take bread. Oatmeal contains as much carbohydrate, but the patient is tempted but once a day and not so easily. An Uneeda biscuit or a shredded wheat biscuit contains more carbohydrate by percentage, but these are definite in size and the patient has been taught and is more vividly impressed with what he is eating.

During the seven to ten days which are usually required to build up a patient's diet to a proper level it is generally necessary to alter the diet daily. Insulin, as has been said, accelerates the process. With its help most patients become nearly sugar-free on Test Diet 2 so that upon the following morning they can begin with a diet with a trifle lower amount of carbohydrate, but more protein and fat, and I usually prescribe C_5PF_5. Thereafter the protein can be raised until it amounts to 1 gram per kilogram body weight, if the patient is an adult, or to 1.5 grams or even over 2 grams per kilogram body weight, if the patient is a child. Similarly the fat can be raised day by day along with the protein, but in order that the total diet may furnish 30 calories per kilogram body weight for an adult, or nearly twice that for a child, it frequently happens that the protein and fat will stop with PF_7 or PF_8, and thereafter the fat alone be increased in cream and butter by special order. If sugar appears with $\frac{E.g.}{C_8}$, drop back to C_6.

The development of the full tolerance of the patient for carbohydrate is favored by these diets and frequently one is gratified to see that patients do far better than was at first anticipated. Elderly diabetics are frequently discharged without the urine becoming quite sugar-free. This is done with the expectation, which experience has justified, that persistence in a diet of slight undernutrition will lead to the

disappearance of the slight glycosuria. Time accomplishes what heroic treatment often fails to secure. In reality these patients demonstrate the recuperative power of the island cells, such as one observes after the abatement of an infection or of an injudicious diet which has brought on acidosis needlessly.

The amount of carbohydrate given is that which allows the patient to keep sugar-free while at the same time receiving 1 gram of protein per kilogram of body weight with fat sufficient for maintenance of weight and strength. In adults the caloric requirements are about 30 calories per kilogram of body weight. If more than 3 grams of fat for 1 gram of carbohydrate must be given, the protein should be lowered to 0.66 gram per kilogram, a figure which is about what the individual of advanced years desires. With as low a protein ration as this the fat can be increased if necessary to 4 or even 5 times the carbohydrate. Such a balancing of carbohydrate and fat, with the limitations of protein described, removes the danger of acidosis. In other words the ketogenic-antiketogenic ratio is not exceeded.

The description of dietary orders demands much more time than the writing of the orders and the execution of the same. This is shown by Table 19 in which a typical case entered the hospital with 9.0 per cent of sugar and became sugar-free in 4 days, acquiring a considerable tolerance for carbohydrate. (Case 3324, Table 19, page 102.)

Insulin.—Insulin aids the patient to rid the urine of sugar. Along with the dietary treatment, therefore, insulin is administered; at first in very small doses, 1, 2, or 3 units before the first meal, and thereafter increased by a unit before subsequent meals until most patients are taking 5 units 3 times a day. Should the evidence furnished by the urine be such as to suggest that the patient would not become sugar-free with the dietary changes and insulin as thus given, more insulin can be administered, but there are few patients who require above 10 units before a meal to allow them to eat sufficient food to maintain strength. Exceptional cases will be described later. Table 18 indicates the general method in which insulin is given.

TABLE 18.—DOSAGE OF INSULIN IN THE TREATMENT OF DIABETES.

Hospital days.	Morning units.	Noon units	Night units.
1	1	2	3
2	4	5	5
3	5	5	5
4	5	5	5
5	5	5	5
6	8	0	7
7	8	0	6
8	8	0	5
9	8	0	4
10	8	0	3
11	8	0	2
12	8	0	1

After the patient has taken 5 or more units of insulin before each meal for a few days and is sugar-free, the noon dose is left out and the day's dose of insulin is divided between that before breakfast and that before the evening meal. In mild cases from here onward the evening dose of insulin may be reduced gradually by a unit a day or, if under observation in the hospital, still more rapidly. Still later, if the patient keeps sugar-free on the diet, one can attempt to leave off the morning dose of insulin; and it is a fact that about one-quarter of all patients coming for treatment at the present time are able to give up their insulin before they leave the hospital. This is not due to the diabetes being cured, but to the fact that dietetic treatment alone is adequate.

If sugar appears in the urine as the Maintenance Diets are increased, a simple way to overcome it is to drop back two carbohydrate days, and then it will generally disappear. This may necessitate an increase sooner or later of protein or fat in order to obtain sufficient calories for maintenance purposes, and this is usually arranged by advancing the protein and fat by one or more days or the fat, as described above, may be increased relatively still more by giving more butter. A very simple way to give additional fat is to double the strength of the cream. Some patients are fond of oil, and this affords an easy method. Still others like their increase in the form of bacon, which is half fat. There are certain patients who enjoy cheese, of which 30 grams of the

standard American cheese contain approximately 8 grams protein and 11 grams fat.

Diabetic patients with involvement of the kidney or high blood-pressure should be given low quantities of protein and salt. For this reason one stops with protein and fat at the third day of the maintenance diets because on the fourth day bacon begins to appear on the schedule, and this contains much salt. For these patients one can substitute cream and give the required amount of protein in salt-free meat.

Diarrhea necessitates the alteration of the diet. Vegetables must be omitted. One large portion of 5 per cent vegetables, usually weighing 150 grams, contains 5 grams carbohydrate or the same as that represented by an Uneeda biscuit, so this is a very satisfactory substitute and patients allowed 600 grams of 5 per cent vegetables a day simply replace the same with 4 Uneeda biscuits. Oatmeal gruel is another good substitute. A simple substitute for C_5PF_5 is 1 quart of milk and 5 ounces of cream. Calculation is given below:

	C.	P.	F.
Milk 960 cc	48	32	32
20 per cent cream 120 cc	4	4	24
	52	36	56

This would be a suitable diet to give a patient after an operation or during a fever. The milk and cream could be administered in various combinations: coffee, tea, cocoa shells, or Vichy Célestins.

Persistence in a suitable diet is rewarded in the long run by excellent results. Elderly patients do not become sugar-free promptly with changes in the diet, but if they adhere to the diet for periods of a few weeks, success is attained. I have known a patient to leave the hospital with a restricted diet which even required insulin to enable the patient to tolerate it, and yet by persistence in the diet the insulin was gradually omitted and eventually the patient achieved a tolerance for over 100 grams carbohydrate. In fact, one such patient who left the hospital taking carbohydrate 78, protein 51, and fat 106 and 10 units of insulin returned in 120 days sugar-free and even went through a serious abdom-

inal operation without the reappearance of sugar and without the need of insulin. The diet of this patient at discharge the second time was carbohydrate 142 grams, protein 54 grams, and fat 126 grams.

Persistence in the diet with younger patients also gives surprisingly good results, but in all these cases results are obtained first by strict adherence to the rules of the game and second by such an arrangement of diet and insulin at the beginning and throughout the course of treatment as will enable the patient to keep constantly sugar-free.

The diet should not be divided equally between the three meals. As a rule a patient tolerates carbohydrate somewhat better at noon and at night than at breakfast. Even though insulin is given before the morning and evening meal the carbohydrate is generally best kept somewhat lower at breakfast than at the midday and evening meal. Already before the treatment with insulin was introduced it had been shown that the assimilation of a little carbohydrate leads to the assimilation of more, hence a considerable number of severe cases of diabetes had acquired the habit of eating 1 or 2 grams of carbohydrate in the form of lettuce or grapefruit one hour before breakfast. By so doing they found that they could not only tolerate the amount of carbohydrate which they previously failed to utilize but even more.

If the morning urine is sugar-free and the urine in the afternoon shows sugar, it is evident that the carbohydrate should be reduced at the noon meal or the insulin increased before it, and a similar rule holds for diet and insulin when sugar shows after the evening meal.

If sugar shows not only in the morning, afternoon and evening specimens of urine but in the night specimen as well, it is evident that the carbohydrate for the twenty-four hours should be reduced or the insulin increased.

If the afternoon and evening urines are free from sugar but the night urine and the urine after breakfast contain sugar, the possibility arises that the patient's meals are too close together or that the patient is too long without insulin at night. Many such cases become sugar-free if the breakfast is taken one hour earlier in the morning and the

evening meal an hour later at night. Thus certain patients must have their insulin at 6.30 in the morning and their evening dose at 6.00 or 6.30 at night. See also pages 99-103.

The above measures usually suffice to render patients sugar-free. In the presence of an infection it may be necessary to give insulin four times a day, and of course in the presence of severe acidosis it is given still more frequently.

Insulin can be given by a nurse, a member of the household, or the patient himself. Undoubtedly great improvement in methods will come in the next few months, but at present it is conservative to follow the direction given below in its administration:

INSTRUCTIONS FOR GIVING INSULIN SUBCUTANEOUSLY.

1. **Sterilizing.**—Wash the hands thoroughly with soap and water.

Wrap the cylinder and the piston of the syringe separately in a piece of cloth and cover them and the wired needle with cold water in a dish, heat to boiling, and let boil for three minutes. Pour off the water, being careful not to touch anything in the dish, and allow to cool by standing.

Paint the top of the insulin bottle with medicated alcohol.

2. **Loading.**—Take barrel and insert in it the piston, being careful not to touch the surface of the piston which enters the barrel and thus contaminate it. Draw out the piston so that the syringe contains a little more air than the amount of insulin needed.

Push the needle cautiously but firmly through the rubber cap until the point is just seen, invert the bottle; force the air from the syringe into the bottle and then withdraw as much insulin as is desired. By holding the syringe and needle point upward air is easily expelled from the syringe before withdrawing it from the bottle.

3. **Injecting.**—The desirable site for injecting insulin is one where the skin is loose. It is necessary to change the place with every dose. For example, the left thigh on Monday, the right thigh on Tuesday, the left arm on Wednesday, the right arm on Thursday, the left leg on Friday, the right leg on Saturday, and so forth.

Having decided on the site for injection, rub gently an area as large as a walnut with alcohol.

Pick up a fold of the skin between the thumb and forefinger of the left hand, and with the syringe held parallel to the skin, push the needle quickly and firmly into the fold nearly up to the butt. The tip of the needle should then feel loose in the soft tissue between the skin and the muscle.

Force the insulin gradually out of the syringe, while withdrawing the needle slowly, so that all of the insulin may not be left in one spot.

Touch the spot lightly with clean cotton until the insulin has been absorbed.

If the insulin has been given too close to the upper layers of the skin a white blister-like elevation will appear.

4. **Cleaning Up.**—Rinse the syringe and needle with cold water immediately. Dry the syringe and needle with a cloth and blow air through the needle repeatedly with the syringe. Rub off any irregularities on the point on a fine stone such as a razor hone. A fine wire should always be kept in the needle.

Certain patients, it is true, do not sterilize their syringes and needles by boiling, but by alcohol. I hesitate at present to advocate indiscriminately such a method. I have known of no abscesses to result in the few patients who have resorted to this method, but these patients were exceptional patients and most deft in their handling of syringe and needle.

The responsibility for the management of the diet of a diabetic patient should always rest upon one individual. As a rule that individual is the patient, but at times it is another member of the household. Children who are above the age of ten years should be taught to plan their own diets. They readily learn to do this and in so doing make their elders blush. In fact, it is more important for diabetic children to learn what and how much to eat than all the knowledge which their schools afford, for upon this information their lives depend. A child at five years should be familiar with the Benedict test and what a positive test means for him. Perhaps it is because this personal responsibility is so deeply felt in the management of little children that the treatment of diabetes in them proceeds so uniformly and always produces results so much better than are expected. Conversely,

the failure of diabetic patients to do well in the open wards of large hospitals has been due not so much to the alleged dishonesty of the patient as to the division of responsibility among several nurses. Errors in the diet or in the collection of the urine must be promptly traced to their source.

The illustration on page 101 shows various problems which may occur in the treatment of diabetes with diet and insulin. In the upper row of test tubes the Benedict test is positive in the morning, afternoon, evening and night specimens of urine. The conclusion is plain. Either the patient is taking too much food or too little insulin. As the patient was not receiving sufficient calories per kilogram body weight, the the insulin was increased and the carbohydrate and protein lowered and the fat raised. With another case, showing a similar Benedict test, it happened that the patient had been sugar-free previously with a little insulin, but it had been given up. The result of the tests convinced the patient that insulin was necessary.

In the second row of tubes in the illustration on page 101 the Benedict test was positive in the forenoon specimen of urine but clear in the afternoon, evening, and night specimens. The patient had enough calories and the questions to decide were: (1) Whether the carbohydrate was divided properly between the three meals; (2) whether the patient was receiving too little insulin before breakfast, because it was after breakfast that the sugar showed; or (3) whether he might have been taking too little exercise after breakfast. A study of the chart showed at breakfast he received less carbohydrate than at any other meal. Consequently, it was quite plain that the trouble was not with the carbohydrate at breakfast, and there remained the alternatives: too little insulin before breakfast or too little exercise after a meal. Before changing the insulin, he was advised to take more exercise, and it was found that the sugar disappeared.

Looking at the test-tubes in the third row shown in Fig. 14, it will be seen that sugar was present in the afternoon specimen but absent from all the others. Examination of the chart disclosed that the patient had no insulin before his noon meal and further that he had as much carbohydrate at noon as at the other meals. Consequently, the first change to get the urine sugar-free for the afternoon was

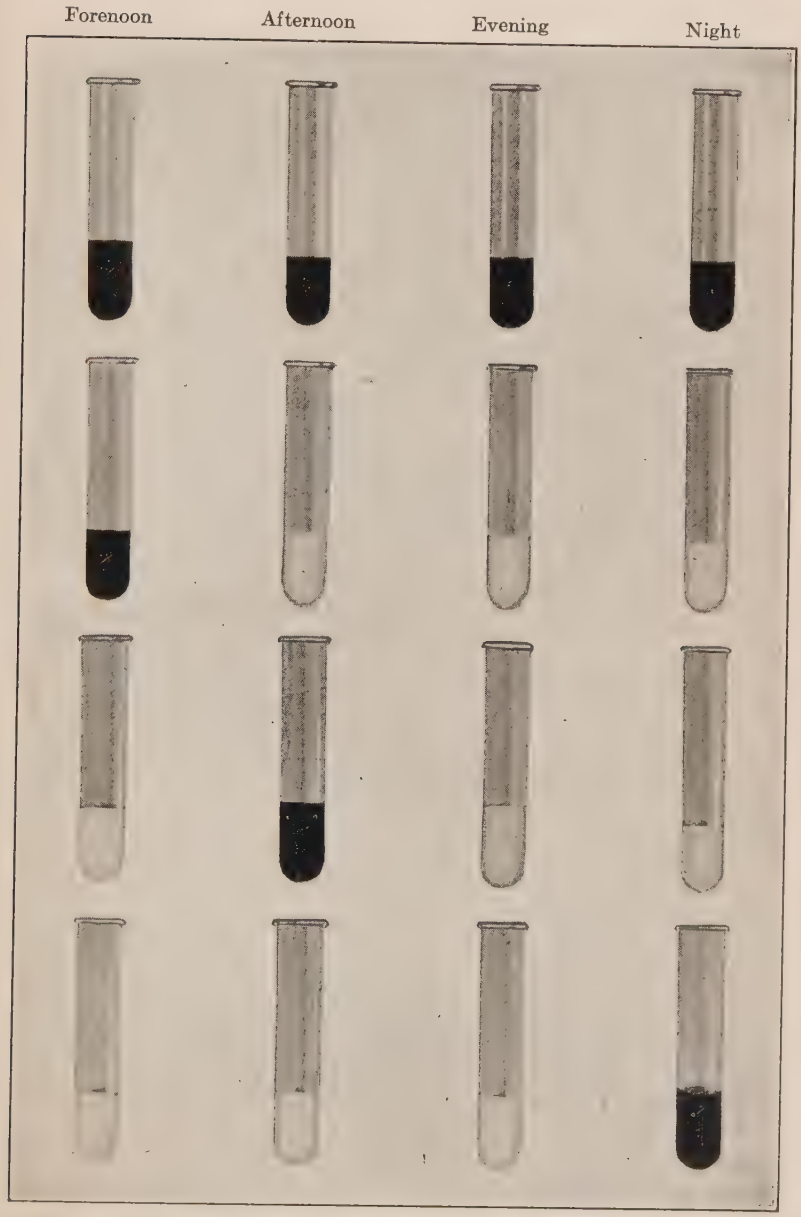


FIG. 14.—The heavily shaded area represents the presence of sugar in the urine at the time of the day indicated.

to decrease the carbohydrate at noon and give a little more at breakfast and night.

In the fourth row of the illustration the specimens representing morning, afternoon, and evening showed no sugar, but the night specimen of urine gave a positive test, despite the fact that a good dose of insulin was given before supper. Here the cause for the presence of sugar was found to be different. It is true the patient was taking insulin before breakfast and before supper and that the carbohydrate was satisfactorily divided between the meals, but it happened that the patient had supper at 5.30 P.M. and did not have breakfast until 8 A.M. in the morning. Consequently, he was left without insulin from 5 o'clock at night, when he took his last dose, until 7.30 o'clock the next morning, which was too long an interval. This patient cleared promptly so soon as he had his breakfast a little earlier and supper a little later.

The following charts in Table 19 illustrate the method of treatment above described and Cases No. 632 and 3496 demonstrate that faithfulness to rules was eventually rewarded.

TABLE 19.—THE SIMPLICITY OF THE TREATMENT OF DIABETES WITH TEST AND MAINTENANCE DIETS.

CASE NO. 3324, BOY, AGE 12.6 YEARS; DURATION, THREE WEEKS.

Day.	Wgt., lbs., net.	Urine.		Blood sugar, per cent.	Diet.				Diet orders.	Insulin, units.
		Diacetic.	Sugar, per cent.		C., gr.	P., gr.	F., gr.	Cal.		
1	76	++	9.0	....	63	23	31	623	T.D.[1]	0–1–2
2	75	+	2.0	0.21	66	24	37	693	T.D.[2]	3–4–5
3	76	0	0.1	....	64	46	82	1178	C 6 PF6	5–5–5
4	78	0	0.1	....	73	44	83	1219	C 7 PF6	5–5–5
5	79	0	0	....	84	45	84	1272	C 8 PF6	8–0–7
6	79	0	0	0.10	96	47	84	1328	C 9 PF6	8–0–7
7	79	0	0	....	106	47	84	1368	C10 PF6	8–0–7
8	80	0	0	....	107	54	89	1445	C10 PF7	8–0–7
9	80	0	0	....	119	55	89	1497	C10½ PF7	8–0–7
10	81	0	0	....	131	60	89	1565	C11 PF7	8–0–7
11	79	0	0	....	131	58	89	1557	C11 PF7	8–0–7
12	80	0	0	....	131	58	89	1557	C11 PF7	8–0–7
13	..	....	...	0.09						

Case No. 3040, Girl, Age Eleven Years; Duration, Nine Months.

Day.	Wgt., lbs., net.	Urine.		Blood sugar, per cent.	Diet.				Diet orders.	Insulin, units.
		Diacetic.	Sugar, per cent.		C., gr.	P., gr.	F., gr.	Cal.		
1	73	0	3.0	....	67	25	29	629	T.D.[1]	1–0–2
2	72	0	0.2	....	66	24	37	693	T.D.[2]	3–4–5
3	75	++	0.3	0.16	52	32	53	813	C 5 PF5	5–0–5
4	75	Sl +	0	....	54	41	64	956	C 5 PF6	5–0–5
5	76	0	0	....	63	51	70	1086	C 6 PF7	5–0–5
6	74	0	0	....	74	52	76	1188	C 7 PF7 20% Cr. 120	5–0–5
7	73	0	0	....	84	53	77	1241	C 8 PF7 20% Cr. 120	5–0–5
8	74	0	0	....	96	54	77	1293	C 9 PF7 20% Cr. 120	5–0–5
9	74	0	0	....	107	56	77	1345	C10 PF7 20% Cr. 120	5–0–5
10	75	0	0	....	131	60	77	1457	C11 PF7 20% Cr. 120	5–0–5
11	74	0	0	0.08[1]	156	61	78	1570	C12 PF7 20% Cr. 120	5–0–5

[1] Blood sugar taken one day later.
[2] Two meals.

Case No. 632, a young officer, aged thirty-five years, with diabetes of one and a half years' duration, came to me first in 1913. At the hospital diacetic acid showed repeatedly, and the ammonia was 1.7 grams, but the tolerance for carbohydrate lay between 15 and 30 grams. Nevertheless, he was discharged with 0.5 per cent of sugar in the urine, and diacetic acid was present, with a diet of 30 grams carbohydrate and a limited quantity of protein, though with an unlimited amount of fat. He returned in February, 1916, and it required twelve days to free the urine of sugar and twenty-one days to rid it of acid, but he left the hospital April 13, having been sugar-free the preceding week, with a tolerance for 28 grams carbohydrate, 79 protein, 133 fat and 9 alcohol. The blood sugar was 0.21 per cent. While at the hospital exercise was utilized to the limit, and, as to be expected of an army man with a Victoria Cross, obedience was implicit, coöperation

ever present and system exact. Permission has been obtained to publish this letter, received eleven months after leaving the hospital.

March 8, 1917.

"I have really been wonderfully well, feel splendid and everyone remarks how well I am looking. Tests have shown a slight trace of sugar on three mornings since October 8 last; all other times absolutely sugar-free. My weight doesn't change at all; if anything I have gotten very slightly lighter. I weigh from 124½ to 125½ pounds. I still stick absolutely rigidly to my routine, but I have gotten up to 30 grams carbohydrate per diem—that is, on the last five days of the week I take 30—rest of diet the same. The last three weeks I have been taking 15 grams oatmeal for breakfast on Monday, Tuesday, Thursday, Friday and Saturday mornings, Wednesday all carbohydrate in 5 per cent vegetables and cream and Sunday (fast day) all carbohydrate in 5 per cent vegetables."

That this improvement continues is evident from another letter of October 12, 1917.

"We had a patriotic golf match here last Saturday and Monday against the rival golf club here. I was chosen to play 2d for the ———, and my opponent and I came out even in both our matches, one over our course and the other over the ———. I am sending you a newspaper clipping of the last game at ———, just to let you see that there is some life in the old dog yet. Since our game Mr. ——— won the club championship of the ———.

"I keep very well, as you may surmise from the above, sugar-free all the time. I stick to the same old routine—30 to 31 grams carbohydrate per diem. I gave up the orange, as I really prefer the 5 per cent vegetables, and I thought that I took the vegetables better. I had a fine five days the end of September, up in the woods, trout-fishing; had good weather and very good fishing. I managed to keep

sugar-free all the time, although I had a good appetite and took lots to eat."

February, 1918, the patient continued in good condition, sugar-free, with tolerance as before, but by November, 1922, the tolerance had decreased to carbohydrate 15 grams, protein 69 grams, and fat 103 grams, and even then the urine showed a few tenths per cent of sugar. The weight had fallen to 111 pounds; the blood sugar was 0.16 per cent before breakfast.

Insulin was begun and gradually the carbohydrate and fat were raised so that during December, 1922, the patient took and assimilated carbohydrate 40 grams, protein 75 grams, and fat 148 grams.

The dose of insulin has always been small, and even after seventeen months, May, 1924, the patient employs but 10 units once a day. Meanwhile the weight has risen to 123 pounds, and the general condition has correspondingly improved. What a compensation for adherence to treatment throughout an interval of thirteen years.

Case No. 3496 developed diabetes at the age of sixteen years in 1916. He was rescued from coma in Florida in May, 1923, through the advice of Dr. Geyelin. Five months later, when his physician was not available, he came under my temporary supervision taking 88 units of insulin daily. During the last six months through faithfulness and a nurse he has been able to reduce the daily dose of insulin to 24 units, coincidently with a gain in weight of 20 pounds.

CHAPTER XI.

ACID INTOXICATION—ACIDOSIS—DIABETIC COMA.

Acid intoxication used to be the bugbear of doctor and patient. Formerly more than 6 out of every 10 diabetic patients succumbed to it, but now less than 3. This is due first to the prevention of the causes which lead up to it and second to insulin.

The acid intoxication which develops in a diabetic is no different from that which develops in a normal individual when he stops eating carbohydrate. When there is no carbohydrate to burn in the body or when the body cannot burn it, as in diabetes, the fat burns only to the stage of fatty acids. These are poisonous, cause acidosis, and, unless removed, lead to diabetic coma.

A diabetic who is sugar-free can take for granted in 999 cases out of 1000 that he is burning enough carbohydrate to ward off danger of acid poisoning.

A sugar-free urine spells safety for a diabetic. A sugar-free urine implies that he is not overeating, and it is from overeating, from taking more fat than can be burned by the carbohydrate utilized, that acid intoxication results. Hence acidosis almost never occurs unless a patient has broken diet. To this there is one exception. When an individual has fever, even though he does not overeat, the body consumes an excessive amount of its own fat, so that in a fever a patient is actually overeating although he takes little food. Under such circumstances acid poisoning can develop. Likewise a moderate degree of acidosis can be converted into a severe degree of acidosis by unusual muscular exertion, because here, too, there is overeating of one's self.

Deaths from acid poisoning decreased with the advent of

undernutrition. In my practice this was accomplished by the restriction of fat, which is so rich in calories. Now, however, we know that excessive protein should be avoided as well, because protein tends to increase the metabolism; in other words, to fan the food flame in the body and thus lead to the consumption of more food, and the only foods available to a diabetic under such circumstances are fat and more protein. For this reason today the protein in the diet of diabetics is kept at or below the same amount a normal individual would eat and the severer the diabetes the less the protein allowed.

In years gone by when doctors saw diabetics growing thin it was very easy to decrease the carbohydrate to get rid of the sugar, and to allow an unlimited supply of fat to increase the weight. Temporarily this advice would occasionally succeed, but eventually it would end in acidosis and a fatal issue.

Insulin helps carbohydrate to burn, and with the burning of carbohydrate in the body acidosis vanishes like dew before the sun. No wonder therefore that there are less cases of diabetic coma today. There need be none if care is taken in the diet and insulin is used in season. On the other hand if the patient has been taking a diet, increased by insulin, and then suddenly omits the insulin, diabetic coma can occur with surprising swiftness.

Signs of the onset of acid poisoning are most indefinite. Consequently, it is a good rule for any diabetic patient if he feels ill, and always if he has fever, to take for granted that he may have acid poisoning and adopt those measures which will prevent its becoming serious. These are very simple.

Treatment of Acid Intoxication. Rules for the Patient.

1. Send for the doctor.
2. Go to bed.
3. Keep warm: Flannel nightclothes. Heaters, but look out for burns!
4. Take an enema to move the bowels. The enema clears the bowels so that later salt solution, a teaspoonful to a pint of water, can be given by the rectum in case liquids are not retained by mouth.
5. Liquids. A cupful an hour. Hot water, tea, coffee, broths, water-oatmeal gruel, orange juice.
6. Secure a nurse or some one in the family who will wait on the patient and do nothing else until the doctor arrives and danger passes.

Treatment of Acid Intoxication. Questions for the Doctor.

1. Has this patient acidosis and is it severe enough to account for his present symptoms?
2. If so, how much and how frequently is insulin to be given? Ten, twenty, or more units? Every hour or every two hours? What does the urine or blood indicate?
3. Is the patient dry? Does he need salt solution injected under the skin?
4. Is the stomach dilated? Does it demand lavage?
5. Does the heart need caffeine or other stimulation?

In the convalescence patient, and physician, too, will do well to make haste slowly. A maintenance diet is gradually resumed in which the protein is between $\frac{2}{3}$ of a gram and 1 gram per kilogram body weight and the grams of fat not more than 3 or 4 times the grams of carbohydrate which the patient can take without the appearance of sugar in the urine.

CHAPTER XII.

WEIGHT PECULIARITIES.

Most diabetic patients are obese prior to the onset of diabetes. However as soon as sugar begins to be lost in the urine, the weight usually falls because the body is unable to utilize the food eaten even though the quantity be excessive. It is not uncommon for a patient to lose 50 pounds before treatment begins, and occasionally a patient will lose as much as 100 pounds during the course of years. A diabetic patient in reality is probably in safer condition if he is 10 to 20 per cent below weight, because thus he can be assured that he is not overeating. In this respect it is better to emulate the Indian than the Eskimo. The individual 10 per cent and even 20 per cent below weight may not be a delight to our eyes, but if over thirty-five years of age and in this condition he is much more acceptable to the Insurance Company. It is often desirable for a patient to lose weight, but this should be undertaken only under the doctor's direction. Frequently it is only by losing weight that a patient regains the power to tolerate carbohydrate. As a guide to the proper weight for a diabetic the average weights of individuals for given heights and weights when dressed are given in Tables 21 to 25.

Gain in weight in the course of diabetes is desirable, but the weight gained should be moderate and not quite sufficient to bring the weight of the patient up to normal standard. Even with insulin one sees the harmful effect of a marked gain in weight, because it is more difficult to keep the urine sugar-free. It is a good rule to keep the weight a little below normal.

Changes in Weight during Treatment.—Diabetic patients are often surprised at the sudden change in weight which they undergo during a short course of treatment. Occasionally the weight goes up, but more often it falls. It may

remain the same or even increase during marked restriction of the diet. The reason for these changes is to be explained by the retention or discharge of water from the tissues. The following experiment conducted by me many years ago illustrates this well: A student was given a diet sufficient to maintain his body weight so far as nutritive value was concerned, but from his food salt was entirely removed. As a result, in the course of thirteen days the weight fell 11.66 pounds. Upon the resumption of his former diet with salt as desired, 9 pounds of those lost were regained in three days. Diabetic patients often gain weight from exactly the same cause—namely, the ingestion of too much salt. Such gain in weight, however, should be looked upon at its real value, in other words, simply as a retention of fluid in the body.

Case No. 1378, showing considerable dropsy, lost weight as shown in Table 20. When the equivalent of the weight lost was weighed out in water it half-filled a pail, and when we realized that this had been carried about all day in the tissues of the patient, all of us were far more sympathetic toward the patient's disinclination to go up and down stairs.

TABLE 20.—CHART OF CASE NO. 1378. ILLUSTRATION OF DISAPPEARANCE OF DROPSY CO-EXISTENT WITH LOSS OF WEIGHT DUE TO A SALT-FREE DIET.

Date, 1917.	Urine.			Diet in grams.					Weight, pounds.
	Di-acetic acid.	NaCl, gm.	Sugar total gm.	Carbo-hydrate	Pro-tein.	Fat.	Alcohol.	Calories	
Sept. 13–14	0	—	0	3	20	6	..	146	89½
23–24	0	4.9	6	17	50	42	50	996	98¾
Oct. 21–22	0	..	0	12	53	52	30	938	69½

Soon after entrance the salt in the diet was partially restricted, but evidently not enough to prevent increase in weight, as the chart shows (see September 23–24). From this point onward the salt was excluded with the greatest care from the diet, and the weight fell uniformly. It is noteworthy that this patient a year previously, some thousands of miles from Boston, had been given during a period of six months enemata of 8 quarts of salt and soda daily. Furthermore, she was then in the habit of taking beef tea loaded

with salt, and each week consumed $1\frac{1}{2}$ pounds of salted almonds, as well as using salt freely in her food.

TABLE 21.—HEIGHTS AND WEIGHTS OF CHILDREN BETWEEN ONE AND FOUR YEARS OF AGE (WITHOUT CLOTHES).[1]

5602 boys			4821 girls	
Height, inches.	Weight, pounds.	Age, months.	Height, inches.	Weight, pounds.
26.5	18.0	6	25.9	16.8
27.3	19.1	7	26.5	17.4
27.6	19.8	8	27.0	18.3
28.1	20.4	9	27.6	19.1
28.5	20.9	10	27.9	19.5
29.0	21.4	11	28.4	20.1
29.4	21.9	12	28.9	20.8
29.9	22.9	13	29.4	21.0
30.3	23.0	14	29.5	21.6
30.8	23.6	15	30.1	21.9
31.1	24.1	16	30.5	22.6
31.4	24.5	17	30.8	22.9
31.8	24.6	18	31.1	23.4
32.3	25.5	19	31.5	23.8
32.6	25.8	20	32.0	24.1
32.9	25.8	21	32.3	24.8
33.3	26.9	22	32.6	25.3
33.6	27.0	23	32.9	25.6
33.8	27.1	24	33.4	26.4
34.0	27.9	25	33.8	26.9
34.1	28.3	26	33.9	27.3
34.8	29.0	27	33.9	27.3
35.1	29.1	28	34.6	27.8
35.4	29.3	29	34.8	27.8
35.4	29.5	30	34.9	28.3
35.5	30.5	31	35.1	28.8
36.0	30.6	32	35.4	29.0
36.1	30.6	33	35.6	29.1
36.5	31.1	34	36.5	30.1
36.8	31.9	35	36.5	30.3
37.1	32.3	36	36.8	30.5
37.4	32.3	37	36.8	30.8
37.5	32.4	38	37.0	31.0
37.9	33.1	39	37.3	31.6
38.5	33.5	40	37.5	32.0
38.6	33.6	41	37.8	32.3
38.6	33.8	42	38.0	32.5
38.8	33.8	43	38.3	32.8
38.9	34.3	44	38.5	33.0
39.0	34.5	45	38.5	33.5
39.0	34.8	46	38.8	33.5
39.3	35.8	47	38.9	33.5
39.5	35.9	48	39.0	33.8

[1] Crum, F. S.: Quarterly Publication of the American Statistical Association, Boston, September, 1916, N. S., No. 115, **15**, 332.

TABLE 22.—HEIGHTS AND WEIGHTS OF BOYS BETWEEN FIVE TO FOURTEEN YEARS (WITHOUT CLOTHES).[1]

BOYS

Weight in Pounds Without Clothes
Height in Feet and Inches Without Shoes

AGE	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	4	4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	5	5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	6	6-1
5	35	36	39	41	42	46																													
6		36	39	41	42	44	46	48																											
7					42	43	46	48	49	54																									
8							45	48	50	53	54	57	59																						
9									50	53	55	58	60	62	62	65																		
10										53	55	58	60	62	65	68	69	71																
11													61	61	65	68	71	77	77	78														
12													63	67	70	75	76	79	84	84	85													
13														67	71	75	78	80	85	86	91	98	99	100										
14														67	71	76	79	82	86	90	94	97	103	107	114	122								
15																	79	82	87	91	95	99	106	112	118	119	121	128	133					
16																					90	98	104	112	120	122	125	129	133	134	136			
17																							104	110	117	122	125	128	130	136	140	140		
18																								118	120	120	126	131	136	139	143	146		
19																									120	126	129	134	136	139	144	146	149	
20																										125	130	132	133	139	145	146	154	155

TABLE 23.—HEIGHTS AND WEIGHTS OF GIRLS BETWEEN FIVE TO FOURTEEN YEARS (WITHOUT CLOTHES).[1]

GIRLS

Weight in Pounds Without Clothes
Height in Feet and Inches Without Shoes

AGE	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	4	4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	5-0	5-1	5-2	5-3	5-4	5-5
5	34	37	38	41	41	45																					
6		35	37	39	41	43	45	48																			
7				39	42	44	45	47	50																		
8						42	45	47	49	51	53	56															
9									49	51	53	56	59	63													
10										54	57	58	62	64	69												
11												60	62	63	68	70	75										
12														63	66	69	71	75	78	83	88	94					
13															65	69	73	78	80	86	89	94	99	104			
14																		78	83	88	93	96	100	104	107	112	114
15																					89	97	100	102	106	109	118	118
16																						100	104	109	111	116	118	121
17																							109	109	110	110	117	125
18																							103	108	107	112	114	120
19																							99	105	111	113	119	123
20																							99	111	114	114	115	125

[1] Wood, T. D.: The ninth yearbook of the National Society for the Study of Education, Part I, Health and Education, Chicago, 1910, p. 34.

TABLE 24.—HEIGHTS AND WEIGHTS OF 221,819 MEN OF FIFTEEN OR MORE YEARS OF AGE (WITH CLOTHES).[1]

Age.	Graded average weight in pounds with clothes.																	
	Feet and inches with shoes.																	
	5–0	5–1	5–2	5–3	5–4	5–5	5–6	5–7	5–8	5–9	5–10	5–11	6–0	6–1	6–2	6–3	6–4	6–5
15	107	109	112	115	118	122	126	130	134	138	142	147	152	157	162	167	172	177
16	109	111	114	117	120	124	128	132	136	140	144	149	154	159	164	169	174	179
17	111	113	116	119	122	126	130	134	138	142	146	151	156	161	166	171	176	181
18	113	115	118	121	124	128	132	136	140	144	148	153	158	163	168	173	178	183
19	115	117	120	123	126	130	134	138	142	146	150	155	160	165	170	175	180	185
20	117	119	122	125	128	132	136	140	144	148	152	156	161	166	171	176	181	186
21	118	120	123	126	130	134	138	141	145	149	153	157	162	167	172	177	182	187
22	119	121	124	127	131	135	139	142	146	150	154	158	163	168	173	178	183	188
23	120	122	125	128	132	136	140	143	147	151	155	159	164	169	175	180	185	190
24	121	123	126	129	133	137	141	144	148	152	156	160	165	171	177	182	187	192
25	122	124	126	129	133	137	141	145	149	153	157	162	167	173	179	184	189	194
26	123	125	127	130	134	138	142	146	150	154	158	163	168	174	180	186	191	196
27	124	126	128	131	134	138	142	146	150	154	158	163	169	175	181	187	192	197
28	125	127	129	132	135	139	143	147	151	155	159	164	170	176	182	188	193	198
29	126	128	130	133	136	140	144	148	152	156	160	165	171	177	183	189	194	199
30	126	128	130	133	136	140	144	148	152	156	161	166	172	178	184	190	196	201
31	127	129	131	134	137	141	145	149	153	157	162	167	173	179	185	191	197	202
32	127	129	131	134	137	141	145	149	154	158	163	168	174	180	186	192	198	203
33	127	129	131	134	137	141	145	149	154	159	164	169	175	181	187	193	199	204
34	128	130	132	135	138	142	146	150	155	160	165	170	176	182	188	194	200	206
35	128	130	132	135	138	142	146	150	155	160	165	170	176	182	189	195	201	207
36	129	131	133	136	139	143	147	151	156	161	166	171	177	183	190	196	202	208
37	129	131	133	136	140	144	148	152	157	162	167	172	178	184	191	197	203	209
38	130	132	134	137	140	144	148	152	157	162	167	173	179	185	192	198	104	210
39	130	132	134	137	140	144	148	152	157	162	167	173	179	185	192	199	205	211
40	131	133	135	138	141	145	149	153	158	163	168	174	180	186	193	200	206	212
41	131	133	135	138	141	145	149	153	158	163	168	174	180	186	193	200	207	213
42	132	134	136	139	142	146	150	154	159	164	169	175	181	187	194	201	208	214
43	132	134	136	139	142	146	150	154	159	164	169	175	181	187	194	201	208	214
44	133	135	137	140	143	147	151	155	160	165	170	176	182	188	195	202	209	215
45	133	135	137	140	143	147	151	155	160	165	170	176	182	188	195	202	209	215
46	134	136	138	141	144	148	152	156	161	166	171	177	183	189	196	203	210	216
47	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
48	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
49	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
50	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
51	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	218
52	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	218
53	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	218
54	135	137	139	142	145	149	153	158	163	168	173	178	184	191	198	205	212	219
55	135	137	139	142	145	149	153	158	163	168	173	178	184	191	198	205	212	219

[1] Association of Life Insurance Directors and Actuarial Society of America, New York, 1912, p. 38. Published by a committee. Allow 1 inch for shoes and 10 pounds for clothes.

TABLE 25.—HEIGHTS AND WEIGHTS OF 136,504 WOMEN OF FIFTEEN OR MORE YEARS OF AGE (WITH CLOTHES).[1]

Age.	Graded average weight in pounds with clothes.																
	Feet and inches with shoes.																
	4–8	4–9	4–10	4–11	5–0	5–1	5–2	5–3	5–4	5–5	5–6	5–7	5–8	5–9	5–10	5–11	6–0
15	101	103	105	106	107	109	112	115	118	122	126	130	134	138	142	147	152
16	102	104	106	108	109	111	114	117	120	124	128	132	136	139	143	148	153
17	103	105	107	109	111	113	116	119	122	125	129	133	137	140	144	149	154
18	104	106	108	110	112	114	117	120	123	126	130	134	138	141	145	150	155
19	105	107	109	111	113	115	118	121	124	127	131	135	139	142	146	151	155
20	106	108	110	112	114	116	119	122	125	128	132	136	140	143	147	151	156
21	107	109	111	113	115	117	120	123	126	129	133	137	141	144	148	152	156
22	107	109	111	113	115	117	120	123	126	129	133	137	141	145	149	153	157
23	108	110	112	114	116	118	121	124	127	130	134	138	142	146	150	153	157
24	109	111	113	115	117	119	121	124	127	130	134	138	142	146	150	154	158
25	109	111	113	115	117	119	121	124	128	131	135	139	143	147	151	154	158
26	110	112	114	116	118	120	122	125	128	131	135	139	143	147	151	155	159
27	110	112	114	116	118	120	122	125	129	132	136	140	144	148	152	155	159
28	111	113	115	117	119	121	123	126	130	133	137	141	145	149	153	156	160
29	111	113	115	117	119	121	123	126	130	133	137	141	145	149	153	156	160
30	112	114	116	118	120	122	124	127	131	134	138	142	146	150	154	157	161
31	113	115	117	119	121	123	125	128	132	135	139	143	147	151	154	157	161
32	113	115	117	119	121	123	125	128	132	136	140	144	148	152	155	158	162
33	114	116	118	120	122	124	126	129	133	137	141	145	149	153	156	159	162
34	115	117	119	121	123	125	127	130	134	138	142	146	150	154	157	160	163
35	115	117	119	121	123	125	127	130	134	138	142	146	150	154	157	160	163
36	116	118	120	122	124	126	128	131	135	139	143	147	151	155	158	161	164
37	116	118	120	122	124	126	129	132	136	140	144	148	152	156	159	162	165
38	117	119	121	123	125	127	130	133	137	141	145	149	153	157	160	163	166
39	118	120	122	124	126	128	131	134	138	142	146	150	154	158	161	164	167
40	119	121	123	125	127	129	132	135	138	142	146	150	154	158	161	164	167
41	120	122	124	126	128	130	133	136	139	143	147	151	155	159	162	165	168
42	120	122	124	126	128	130	133	136	139	143	147	151	155	159	162	166	169
43	121	123	125	127	129	131	134	137	140	144	148	152	156	160	163	167	170
44	122	124	126	128	130	132	135	138	141	145	149	153	157	161	164	168	171
45	122	124	126	128	130	132	135	138	141	145	149	153	157	161	164	168	171
46	123	125	127	129	131	133	136	139	142	146	150	154	158	162	165	169	172
47	123	125	127	129	131	133	136	139	142	146	151	155	159	163	166	170	173
48	124	126	128	130	132	134	137	140	143	147	152	156	160	164	167	171	174
49	124	126	128	130	132	134	137	140	143	147	152	156	161	165	168	172	175
50	125	127	129	131	133	135	138	141	144	148	152	156	161	165	169	173	176
51	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
52	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
53	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
54	125	127	129	131	133	135	138	141	144	148	153	158	163	167	171	174	177
55	125	127	129	131	133	135	138	141	144	148	153	158	163	167	171	174	177

[1] Association Life Insurance Directors and Actuarial Society of America, New York, 1912, p. 67. Published by a committee. Allow 1½ inches for shoes and 6 pounds for clothes.

Removal of the carbohydrate in an individual's diet, though replaced by an equivalent number of calories in the form of fat, causes a prompt fall in weight, and if the reverse procedure is adopted, the weight will rise. The loss or gain of weight which occurs under such conditions may amount to 2 pounds in a day for several days. It is explained by the varying quantities of water which are retained in the body according to whether carbohydrate or fat is stored.

Finally, there is a real reason for a loss of weight during the treatment of diabetes, due to the fact that at times the diet is deficient in calories. Under these circumstances the patient lives upon his own tissues. Calculations show that under such circumstances from every pound lost approximately 1500 calories are derived. To gain or lose 1 pound, therefore, approximately 1500 calories excess or deficit are required in the daily menu.

The foregoing height and weight tables (Tables 21 to 25, inclusive) were selected by Dr. Horace Gray as the most satisfactory in the literature.

CHAPTER XIII.

THE DIABETIC DIET IS EXPENSIVE.

This is true whether the patient is untreated or treated, but in the former state the waste of food is enormous.

Case No. 1171, before treatment was begun, told me that he ate thirteen eggs for breakfast, not by any means as a stunt, but because he wanted them. Case No. 1147, a lady, thirty-five years of age, ate a dozen eggs a day, and in response to my request gave me a report of her daily diet before she began treatment. This is shown in Table 26. It will be observed, however, that the carbohydrate was below normal—good evidence, therefore, that her diet had already been somewhat altered from the normal before the time at which she reported; in fact, I think her diet was originally considerably in excess of that recorded.

Table 26.—Estimated Diet of a Woman of Thirty-five Years, Case No 1147, Prior to Treatment. Weight, Seventy-two Kilograms.

Food for twenty-four hours.	Quantity.	Carbohydrate, gm.	Protein, gm.	Fat, gm.
Eggs	12	0	72	72
5 per cent vegetables	450 gm.	15	8	0
Milk	2000 cc	96	64	64
40 per cent cream	240 "	8	8	96
Butter	90 gm.	0	0	75
Meat	120 "	0	32	20
Bread	100 "	60	10	0
Totals		179	194	327
		4	4	9
Total calories		716	776	2943

Total calories 4435 ÷ 72 kilograms = approximately 60 calories per kilogram body weight.

Although the diet contained 60 calories per kilogram body weight instead of the normal 30 calories, the patient, while

upon it, lost 66 pounds in a little over two and a half years. The reason for this was apparent, for on October 6, 1916, the volume of the urine was estimated at 6000 cc (6 quarts) and the sugar was found to be 5 per cent, or 300 grams (10 ounces), the equivalent of a loss of 1200 calories in the urine in twenty-four hours. In one year this would amount to 240 pounds of sugar! After a two weeks' stay in the hospital she felt more content with a diet of 1600 calories—a trifle less than her body needs—than when upon the 4400 calories at entrance.

It is obvious that the saving of food which results from becoming sugar-free under modern treatment must be considerable. It is the diet of the untreated diabetic which is expensive, since the large excess is far worse than wasted.

Case No. 295 voided in twenty-four hours, on October 23–24, 1909, approximately 10 liters of urine (nearly 20 pounds), containing 680 grams of sugar, the equivalent of 2720 calories! The weight of this patient was 50 kilograms, 110 pounds. In other words, he lost in the urine 54 calories per kilogram, an amount sufficient in calories to supply almost double his own needs if taken in the form of food which he could assimilate. He probably ate about as much food as three men of his own size would have eaten.

Diabetic patients with acid poisoning lose calories in the urine in the form of sugar and of acid bodies as well. The quantity of acid bodies thus lost is quite considerable. These acid bodies represent wasted food just as much as does the sugar in the urine. Case No. 344 is a good illustration of this. On December 25–26, 1911, he excreted 188 grams sugar, the equivalent of (188 × 4) 752 calories, and in addition 55 grams acid bodies, equivalent to (55 × 5) 275 calories. Acid intoxication is really a dreadful robber, for besides stealing the food of a patient, it frequently steals his life! Against it the diabetic can insure himself by not overeating and particularly by not overeating of protein and fat.

The diet of the treated diabetic is also expensive. In comparing the diet of the diabetic patients with those of the non-diabetic patients at the New England Deaconess

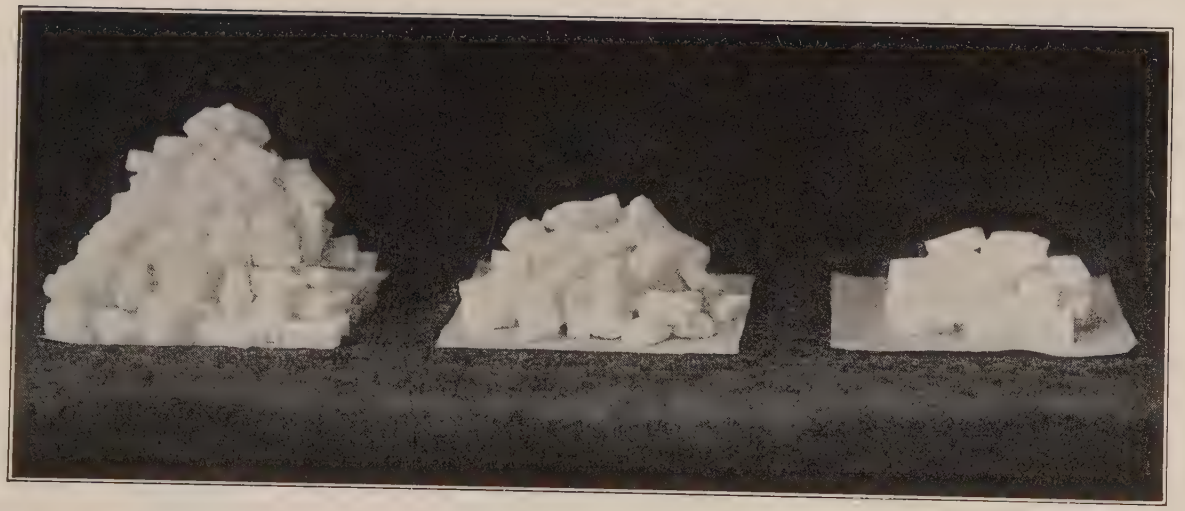


FIG. 15.—SUGAR, MEASURED AS LUMP SUGAR, LOST IN THE URINE BY UNTREATED DIABETIC PATIENTS.

Case No. 295
A Severe Diabetic
680 grams a day
546 pounds (1½ barrels) a year

Case No. 1147
A Moderate Diabetic
300 grams a day
240 pounds (⅔ barrel) a year

Case No. 653
A Mild Diabetic
174 grams a day
140 pounds (⅖ barrel) a year

Hospital, Miss Dike and Miss Wallace found that the diabetic diet was 26 per cent more expensive. The diabetic patient cannot subsist on cheap carbohydrate foods, such as cereals, bread and potatoes, but must replace these with expensive varieties such as eggs, meat, broths and fresh vegetables. In addition to the cost of the raw materials the labor entailed in the preparation is a factor of considerable importance.

The diabetic can save expense if discretion is employed. Tea and cocoa shells are cheaper than coffee and cracked cocoa. Gelatin and agar-agar can be used sparingly or not at all. India gum costs less. Oleomargarine or other preparations may be substituted for butter and employed instead of bacon and cream. Vegetables, whether fresh or canned, can be purchased in bulk. Broth is expensive and a luxury. The home canning of vegetables in diabetic families should be encouraged. A garden is a great advantage.

Lettuce may be the best vegetable for a diabetic, but cabbage is the cheapest. Patients seldom tire of cabbage any more than normal individuals tire of potato. Perhaps this is because it can be served in so many different forms.

Fats are expensive as compared with carbohydrate foods, but there is great variation in the cost of fat. One of my patients made the following computations:

One cent in 20 per cent cream yields	26	calories.
One cent in butter	"	52	"
One cent in oil	"	110	"

CHAPTER XIV.

CARE OF THE TEETH.

Diabetics generally have poor teeth, not because they have diabetes, but because the teeth have been neglected. In one series of 300 patients nearly one-half had poor teeth or none at all. Perfect teeth in a diabetic are rare, but not unknown, even when the diabetes is of long duration.

Good teeth are an asset to a diabetic, because the diabetic diet is a coarse diet consisting largely of green vegetables and these must be thoroughly masticated to avoid indigestion. Bad teeth are a handicap to a diabetic, because the infection which accompanies them makes the diabetes worse. Bad teeth are worse than no teeth. A diabetic cannot afford to tolerate anything which makes his disease worse, consequently he should get rid of all the poor teeth which proper treatment cannot save.

Extraction of teeth in a diabetic is a simple affair if performed by a competent dentist and by one who is acquainted with diabetics. Such a dentist knows that injury to the gums of a diabetic should be avoided with unusual care, thereby averting the opportunity for a fresh infection. If the teeth are in such a state that they can be removed easily, there is no reason against taking out even as many as fourteen at a single sitting. In fact Case No. 3335, Mrs. ———had this number removed one day and stood up in the class the next morning, so that all might see that though seventy-eight years of age she had experienced but little discomfort.

Most extractions are performed with novocaine, care being taken to avoid extensive infiltration of the tissues. Gas-oxygen is very satisfactory, but ether is contraindicated unless the patient is protected with insulin.

Time spent in a hospital by a diabetic to get sugar-free and

learn the diet should be utilized to have the teeth put into perfect condition. There is no question but that removal of infections about the teeth is advantageous and helps raise the tolerance for carbohydrate. The infections may be slight, yet, if allowed to persist, they prevent the patient utilizing the food he would be very glad to eat. How injurious an infection is any mother who has a diabetic child knows, because sugar in the urine promptly appears so soon as even a slight cold is contracted. Tolerance for the diet on which the patient has lived for months and has been sugar-free falls under such circumstances.

A diabetic should see his dentist every three months. In addition to the usual examination, cleaning and treatment of the teeth, it is desirable in most instances once a year to have a Roentgen-ray examination. Over and over again trouble is found in this way which otherwise would not have been detected.

The mouth should be thoroughly rinsed out after each meal and the teeth cleaned at least twice each day.

CHAPTER XV.

CARE OF THE SKIN AND FEET.

Importance of Keeping the Skin Clean and of Prompt Treatment of the Slightest Injuries, Particularly of the Feet.—Gangrene caused 1 in 5 of the fatal cases of diabetes in Boston between 1895 and 1913. Over half of the fatal diabetic cases in four large Boston hospitals during 1923 were due to gangrene and infections, and so were 9 of the 14 fatal cases among the 612 treated by all the Staff at the New England Deaconess Hospital the same year. The overwhelming majority of all such deaths is needless and could be prevented by cleanliness, proper care of the feet, and early treatment of all wounds, insignificant though they are in the beginning. Exceptionally gangrene will develop because of the closure of a bloodvessel and without any abrasion of the skin having occurred. Cleanliness is here not a factor, but this is seldom. Each patient treated at the Deaconess Hospital is told to protect the reputation of the institution and its doctors by avoiding death by gangrene.

An infection makes the diabetes worse. When case No. 3589 had a septic arm, 90 units of insulin failed to keep the urine sugar-free; when the infection was removed, sugar disappeared though the insulin was reduced to 30 units and carbohydrate and calories were increased. It makes little difference whether the infection is general, as in pneumonia, or local, as in the case of a boil, a carbuncle, an abscessed tooth, an infected finger or toe, an inflamed appendix or gall-bladder. Therefore, all infections should be promptly and energetically treated.

The skin of a diabetic should be kept exquisitely clean. A diabetic should be recognized for his clean skin and clothes. If his feet are kept as clean as his face, gangrene and infections will seldom occur. With patients over fifty years of age it is usually more important to look at their feet than

their faces. It is far easier to make the skin of the feet of an old man or woman look young than the skin of the face.

Feet are such an index of the way one has been brought up.

Hygiene of the Feet.—1. Wash feet daily with soap and water. Dry thoroughly, especially between toes, using pressure rather than vigorous rubbing.

2. When thoroughly dry, rub well with hydrous lanolin as often as necessary to keep skin soft, supple and free from scales and dryness, but not enough to render feet tender. If nails are brittle and dry, soften by soaking in warm water one-half hour each night and apply lanolin generously under and about nails and bandage loosely. Clean nails with orange-wood sticks. Cut the nails only in a good light and after a bath, when the feet are very clean. Cut the nails straight across, and avoid injury to the toes. If you go to a chiropodist, tell him you have diabetes.

3. Wear shoes which are large, broad, and flexible, and do not bind or rub. Wear new shoes one-half hour only on the first day and increase one hour daily.

4. If feet become too soft and tender, rub once a day with alcohol.

Treatment of Corns and Callosities.—1. Wear shoes which cause no pressure. The Japanese seldom have gangrene. Beware of nails and torn linings in old shoes and wear new shoes for the first time in the evening. It is wise to have two pairs of shoes which differ slightly from one another and to wear them on successive days.

2. Soak foot in warm, soapy water, dry and rub with gauze or file off dead skin. A corn may be painted with the following mixture: Salicylic acid, 1 drachm; collodion, 1 ounce. Repeat for four nights, then, after soaking in warm water, the corn will come off easily.

3. Do not cut corns or callosities.

4. Wear pad to distribute pressure if necessary.

Circulatory Aids.—1. *Exercises.*—Bend the foot down and up as far as it will go 6 times. Describe a circle to the left with the foot 6 times and then to the right. Repeat morning, noon and night. Rising on tiptoes 20 times is an excellent exercise.

2. Avoid *sudden* changes in temperature.

3. If subject to chilblains, wash feet daily in *warm* water, dry carefully, and powder lightly with borated talcum powder. Wear woolen stockings and avoid extremes of temperature.

4. Massage with lanolin.

5. Buerger gravity—hyperemia method for bed patients gives excellent results, as does the violet ray in indolent sores.

Treatment of Abrasions of the Skin.—1. In the diabetic insignificant injuries may result very seriously, therefore, proper first-aid treatment is of the utmost importance.

2. Avoid strong irritating antiseptics, such as sulphonaphthol and iodine.

3. As soon as possible and after injury apply sterile gauze saturated with medicated alcohol. Keep wet for one hour by pouring on more alcohol. Sterile gauze in sealed packets may be purchased at drug stores. Purchase a tube of boric acid ointment. Later keep wound covered with boric acid ointment on sterile gauze. Change daily until healed.

4. Elevate and avoid using the foot as much as possible until wound is healed.

5. Consult your doctor for any redness, pain, swelling or other evidence of inflammation.

Pruritus pudendi (itching of the genitals) frequently occurs in diabetes and will usually vanish within a few days, but occasionally not until two weeks after the disappearance of sugar from the urine. General pruritus, on the other hand, is exceptional, may be annoying and persist for weeks. It does not occur in young diabetics. If pruritus does not clear up promptly, as the urine becomes sugar-free, an examination will probably disclose a prolapse, leukorrhea, or urinary incontinence. Rest in bed, absolute cleanliness, simple douches, and the simplest of ointments are indicated. The free use of oil to prevent irritation during micturition is helpful. There may be cases where $\frac{1}{4}$-skin doses of Roentgen-ray becomes necessary to allay the itching.

Certain of the angry eruptions seen about the genitals, buttocks, in the groins, armpits, or under the breasts are

due to an infection with a special organism (epidermophyton). This condition is best treated by a skin specialist.

If there is the slightest tendency to boils, furunculosis, at once adopt simple measures analogous to those described by Bowen.[1] The patient is advised to wash the whole body twice a day with soap and water, using a fresh piece of sterilized gauze and powdered or liquefied soap and to dry the skin with a freshly boiled towel without rubbing, so as to avoid breaking open any pustule; the whole body is then bathed with a saturated solution of boracic acid in water, with the addition of a small proportion of camphor water and glycerin. I have often advised a solution of 2 parts medicated alcohol No. 1 and 1 part water to advantage, but I notice that Bowen, in his second paper, still prefers the boracic acid. Individual furuncles may be treated with the following ointment, according to Bowen:

Boracic acid	4
Precipitated sulphur	4
Carbolated petrolatum	30

One should be careful, however, not to overtreat the skin. Harm may result from frequent dressings. The simplest lotions should always be employed. In severe cases the patient should be put to bed, all linen changed twice daily, and the patient treated in as aseptic a way as possible. In a few cases vaccines have appeared to be of marked benefit. "This procedure—thorough bathing and soaping, the application of the borated solution and the dressing of the individual furuncles—is repeated, as has been said, morning and night. A further point of vital importance relates to the clothing that is worn next to the skin. Every stitch of linen worn next to the skin should be changed daily, and in the case of extensive furunculosis all the bedclothing that touches the individual, as well as the nightclothing, should be subjected to a daily change. Naturally, this treatment must be continued for several weeks after the last evidence of pyogenic infection has appeared, and this fact must be emphasized to the patient at the outset." (Bowen.) Stannoxyl, 1 pill with water after each meal, is well worth a trial.

[1] Bowen: Jour. Am. Med., 1910, **55**, 209; Boston Med. and Surg. Jour., 1917, **176**, 96.

CHAPTER XVI.

TREATMENT OF CONSTIPATION AND DIARRHEA.

CONSTIPATION.

The bowels should move daily. To this end nothing compares in effectiveness with the cultivation of regular habits and hours for this purpose. Time is required, and a half hour or even more assigned to the toilet at the same time of the day for three successive days will often bring relief from constipation and this will persist for months. The coarse vegetables and fruits of the diet may prove quite sufficient, but if necessary bran muffins (see pages 132, 133 and 149) and agar-agar jellies (see page 151) may be employed. Mineral oil used in place of olive oil as an ingredient of mayonnaise salad dressing is excellent. (See pages 156 and 157. If potatoes are included in the diet, the baked potato skins may solve the difficulty. Never purge the bowels, but depend upon an enema or upon simple laxatives such as, aloin, grain $\frac{1}{5}$; fluid extract of cascara sagrada, 10 to 30 drops; extract cascara sagrada, 5 grains, or compound rhubarb pills. The last are very satisfactory. In certain rhubarb pills the presence of peppermint or salicylate may lead to the excretion in the urine of an acid and thereby give rise to an unwarranted report of acid poisoning. (See page 203.) This is no deterrent to their use.

Citrate of magnesia in liquid form is contraindicated. In one preparation examined there was found 11 per cent of sugar. The amount of sugar in one bottle was more than 2 tablespoonfuls.

If the patient has not had a movement for several days, at the beginning of treatment give an enema and follow by some simple cathartic or mild aperient, and then give another enema twelve to twenty-four hours later; but do not purge

the patient. Gain enough is obtained if a movement is produced once in twenty-four hours when it has only been taking place once in seventy-two. In other words, do not upset any patient who is in a tolerable state.

The following exercises for constipation were recommended to me by Mr. Gustaf Sundelius:

1. **Abdominal Kneading and Stroking.**— *Kneading.*—Lying down, with knees slightly drawn up, place hands one on top of the other on the abdomen at the right groin; with small circular movements and deep pressure work upward until the ribs are met, then across toward left, following the boundary line of the chest, then downward to the left groin. Repeat 20 to 50 times. *Stroking.* With hands similarly placed, make long, steady and deep strokes, following the same route. Repeat 25 to 100 times.

2. **Leg-rolling.**—Lying down, take hold of both legs just below the knees, press the knees up close to the abdomen, then carry them apart, then down and inward until they meet again, thus letting the knees describe two circles. Repeat 10 to 20 times.

3. **Abdominal Compression.**—Standing against the wall with hands clasped behind neck, draw the abdomen forcibly in, using the abdominal muscles, hold a second, then let go. Repeat 10 to 40 times.

4. **Trunk-rolling.**—Standing with hands on hips, feet apart and legs well stretched, roll the upper body in a circle on the hips by bending forward, to the left, backward and to the right. Then reverse, and repeat 6 to 12 times each way.

Case No. 559 warded off constipation by sawing wood, and Case No. 265 regulated his bowels by eating a slice of raw cabbage for breakfast. This is one of the reasons why cabbage next to lettuce is the most useful diabetic vegetable.

DIARRHEA.

The reverse of constipation, diarrhea, is rare in diabetes. It is a serious complication. When it occurs the patient should go to bed immediately, keep warm, and live upon hot water, hot weak tea, and strained oatmeal gruel which is

thoroughly cooked and made with water. If liquid is not retained by mouth, it may be necessary to give salt solution subcutaneously. The lower bowels should be cleared with an enema, and if there is any suggestion of undigested food remaining in the stomach this should be removed by lavage or induction of vomiting. A Seidlitz powder may be given. The physician may administer an opiate. Rest in bed is the essential and the best sort of treatment. The diet should be gradually resumed, adding the coarse vegetables last. The few days of restricted quantities of food may be of real help to the patient.

Diarrhea necessitates the reduction of insulin because of the small quantities of carbohydrate in the diet and the little that may be absorbed. Occasionally it must be omitted entirely. At such times, unless under medical observation, it is probably safer for the patient to decrease the insulin to such an extent that sugar begins to show in the urine.

Diarrhea and fasting were the weapons used by Guelpa to get his patients sugar-free, and they were most efficacious. Consequently, when these conditions occur by chance in a patient, caution is demanded or else a little insulin will produce an unexpectedly great effect.

Diarrhea in any diabetic is dangerous. Call the doctor.

CHAPTER XVII.

DOGS, DIABETICS AND THEIR FRIENDS.

A DOG is a diabetic's thoughtful friend.

A dog never says to a diabetic "You are thin," never speaks about his diet, never tempts him to break it and to eat a

FIG. 16.—A diabetic child and his dog.

little more, never refers to the delicacies he himself has eaten or the good bones he expects to eat, in fact never implies by any sign or action in public or in private that he knows his

master has diabetes. A diabetic is never embarrassed by his dog. How often he wishes his friends were as considerate!

A dog is a diabetic's teacher. His dog shows the diabetic how to rest and sleep at odd moments, shows him how to exercise and play, indicates the value of sunshine, and sets him a good example by cleaning his paws every night. A dog is cheerful. The friends of a diabetic sometimes wish that he would take lessons from his dog.

From experiments on a dog Minkowski found out that diabetes originated in the pancreas. From experiments on a dog Allen learned that undereating helped and overeating harmed diabetics. From experiments on a dog Banting and Best discovered insulin.

When I see this little boy, George, and his dog, Bob, and their devotion to one another, I am reminded of the million diabetics and future diabetics in the United States who may not be holding a dog in their arms, yet are alive today or will be alive, enjoying better health and happiness, all because a few dogs through the instrumentality of multitudes of scientific workers have revolutionized the treatment of diabetes.

Would you want to be a member of a society if it had for its object the prevention of a dog saving the life of a child? Do you think this dog, Bob, would want to join such a society?

CHAPTER XVIII.

DIETETIC SUGGESTIONS, RECIPES AND MENUS.

The modern diabetic has little need for diabetic recipes, because the diabetic diet today is sufficiently varied and liberal to be both palatable and satisfying. Plain foods well cooked are enjoyed the most, and the taste for such grows rather than wanes. The "Old Guard," the diabetics of seven years' duration, seldom care for frills. They like their four large portions of 5 per cent vegetables, 2 small oranges, their ½ pint of cream of medium strength, 2 eggs, 4 strips of crisp bacon, 1 portion of meat of moderate size, and 3 portions of butter, the equivalent of carbohydrate 48 grams, protein 59 grams, fat 115 grams, calories 1463. If, in addition, a small saucerful of oatmeal and heavy cream instead of medium cream are allowable, nearly 500 calories are gained and the diet becomes luxurious and there is no cause to yearn for other foods. The less a diabetic alters this regime, the easier it is for him in the long run to adhere to it.

Diabetic recipes today represent largely a rearrangement of the simple foods just mentioned. Artificial and proprietary foods are seldom long employed. There are, however, certain food substitutes wholly without food value, yet serviceable for bulk, such as bran, agar-agar, India gum and mineral oil, which are very useful. None of these preparations have the harmful quality of many diabetic foods in former days, namely, a content so rich in protein and fat as to lead to over-nutrition and hence to acid poisoning. Every doctor and every diabetic today know that overeating is harmful alike to diabetic and non-diabetic.

Substitutes for Bread.—There are four types of bread substitutes:

(*a*) **Bran Bread.**—Bran is being more and more employed in the diet of diabetic patients, but it is usually bran washed

nearly free of carbohydrate. This is neither more nor less than the use of cellulose, and this is supposed to have no effect upon the metabolism. Unfortunately, the availability of the protein, fat, and carbohydrate of unwashed bran to the diabetic patient has not been determined, although there are plenty of data upon its digestibility by ruminant animals. Bread made of bran alone is not very palatable, though with the fat of bacon or butter it is liked better. It furnishes bulk and acts favorably upon constipation. It should be remembered that untreated bran contains about 56 per cent of carbohydrate of which approximately one-half is assimilable. For this reason bran biscuits bought at a restaurant often prove to be a delusion and a snare. In purchasing bran to use for washed bran go to a feed store and ask for coarse bran for cattle and not for bran for the table. The various preparations of bran, bran breads and cookies sold under trade names often contain carbohydrate other than bran, hence the reason for their palatable taste. Beware of them. They may contain over 60 per cent carbohydrate, of which less than 10 per cent is real bran. Mild diabetics get into little trouble with bran, but the serious ones often suffer. Feed bran contains about 28 per cent assimilable carbohydrate.

To free bran from starch, first sift in an ordinary flour-sifter. This eliminates a great deal of the finer starch. Then tie the bran in cheesecloth and fasten the same on a faucet. It should be thoroughly mixed and kneaded from time to time to be sure the water reaches all portions and should be washed until the water comes away *clear*. This may require an hour.

Bran Wafers.

Washed bran . . .	2 cups	Salt and saccharin to taste.
India gum . . .	1 tablespoonful	Ginger, cloves, anise or caraway
Mineral oil . . .	1 tablespoonful	seeds, ½ teaspoonful, if desired.

Mix dry ingredients and then add bran and mineral oil with enough water to make a stiff dough. Knead with finger tips. Pat out and cut into thin cookies. Bake about forty-five minutes in a moderate oven until crisp.

Bran Biscuits for Constipation.—The following rule was given me by Dr. F. M. Allen:

Bran	60 gm.
Salt	¼ teaspoonful
Agar-agar, powdered	6 gm.
Cold water	100 cc (½ glass)

Tie bran in cheesecloth and wash under cold water tap until water is clear. Bring agar-agar and water (100 cc) to the boiling-point. Add to washed bran the salt and agar-agar solution (hot). Mold into two cakes. Place in pan on oiled paper, and let stand for half an hour; then, when firm and cool, bake in moderate oven thirty to forty minutes.

The bran muffins naturally will be far more palatable if butter and eggs are added. This may be done providing the patient allows for this in the diet.

Bran Cakes for Diabetics.

Food.	Amount.	Protein, gm.	Fat, gm.	Carbohydrate, gm.	Calories.
Bran	2 cups				
Melted butter	30 gm.	..	25	..	225
Eggs (whole)	2	12	12	..	156
Egg-white (1)	25 gm.	3	..	..	12
Salt	1 teaspoonful				
Water					
		15	37	0	393

Mix the thoroughly washed and dry bran, well beaten whole eggs, butter, and salt. Beat the egg-white very stiff and fold in at the last. Shape with knife and tablespoon into three dozen small cakes. If desired, ½ gram of cinnamon or other flavoring may be added. Each cake contains: protein, 0.5 gram; fat, 1 gram; calories 11.

For analyses of preparations of bran, see page 192.

(*b*) **Gluten Breads.**—These breads are made by removing the sugar-forming material from the flour. It is surprising how thoroughly this can be done. I have often found the percentage of carbohydrate in one such flour to be negligible. Unfortunately in certain gluten breads the content of carbohydrate may be high. The large quantity of protein which

they contain in small bulk is objectionable. Hence gluten bread should never be prescribed without a knowledge of its content of carbohydrate, protein, and fat.

(*c*) **Light Breads.**—French bread cut in thin slices is a possible substitute for bread, because it is bulky, gives the appearance of a large quantity, and carries much butter. Manufacturers have taken advantage of this idea, and many light breads are on the market. These breads often contain about the same quantity of carbohydrate as ordinary bread, though a few contain considerably less. Their virtue consists solely in their bulk, which allows a surface on which to spread butter. It is better for the patient to forget the taste, and to follow the advice of Case No. 2962, who replied at a clinic before the Tri-State Medical Society at the Harvard Medical School when I asked what diabetics were to do with apples—"throw them away."

(*d*) **Various other substances** have been used for flour in the manufacture of bread. Thus, aleuronat meal, corn cob meal, casein under various trade names, and soy beans have been employed, and the manufacturers have been most ingenious in their preparation.

Soy bean is extensively used, and probably deserves a still wider introduction into the diabetic diet. The carbohydrate in it is unassimilable. Agar-agar may be used to dilute the flour or to add to bran and also to relieve the constipation of the diabetic, which is frequently troublesome. For the last few years India gum, suggested to me by Dr. Allen, has been substituted. It is much cheaper, and is as satisfactory. India gum will thicken broth or any fluid. In the right proportions it is the fundamental for a great many palatable recipes.

Substitutes for Milk.—A few tablespoonfuls of cream are a great comfort to a diabetic patient. The average patient usually receives 120 cc to 240 cc of 20 per cent cream daily. If it is desirable to give more fat without increasing carbohydrate and protein, 40 per cent cream may be substituted. Light cream contains about 12 per cent fat, medium cream about 25 per cent and heavy cream 40 per cent fat.

It is economical and convenient to give either ¼ of a pint or ½ of a pint of cream a day. This makes the quantity definite, corresponds to the customary quantity which is sold, and will last either one day or two days. Twenty per cent cream is represented by the upper 4 ounces on a quart of milk which has stood twenty-four hours.

The fat having been removed, the chief value of milk to the diabetic patient is lost. The percentage of sugar in sour milk is not much less than in fresh milk. Sugar-free milks[1] have been put upon the market on a large scale, and many of my patients, particularly children, have found them of distinct advantage. These preparations of diabetic milk will keep from one to three weeks, and are consequently of value to patients when traveling. As a rule they are concentrated one-half. Consequently they should be diluted before being used. This is advantageously accomplished with an equal part Célestins Vichy or White Rock.

Williamson suggested the following rule for the manufacture of artificial milk: "To about a pint of water, placed in a large drinking pot or tall vessel, 3 or 4 tablespoonfuls of fresh cream are added and well mixed. The mixture is allowed to stand from twelve to twenty-four hours, when most of the fatty matter of the cream floats to the top; it can be skimmed off with a teaspoon easily, and upon examination it will be found practically free from sugar. This fatty matter thus separated is placed in a glass. Add the white of an egg and stir the mixture well. Then dilute with water until a liquid is obtained which has the exact color and consistency of ordinary milk. If a little salt and a trace of saccharin be added, a palatable drink, practically free from milk sugar, is produced."[2]

Rennet may be made from milk, but unless the curd is carefully washed it will contain 2 to 2.5 per cent lactose. When the rennet is made from cream, the lactose is materially diminished. Kefir contains approximately 2.4 per cent milk sugar. Von Noorden says this milk has been of great help in the treatment of diabetes in children.

[1] See page 190.

[2] D. Whiting & Sons, Boston.

Lawrence Litchfield, of Pittsburgh, gives whipped cream to his patients, made according to the following rule: Add 2 ounces of 40 per cent cream to a pint of cold water in a Mason jar and have it shaken vigorously until the cream is thoroughly "whipped." Sometimes a trace of saccharin is added, usually not. "My patients like to eat this with a spoon, but, of course, it can be used in any way that is desired." It contains carbohydrate 2 grams, protein 2 grams, fat 24 grams.

Bavarian Cream (Diabetic).

Food.	Amount.	Protein, gm.	Fat, gm.	Carbohydrate, gm.	Calories.
Cream, 40 per cent . .	90 cc	3	36	3	348
Water	10 cc				
Egg (1)	50 gm.	6	6	..	78
Gelatin	2 gm.	2	..	..	8
Saccharin (to sweeten), Flavoring (to taste)					
		11	42	3	434

Soften the gelatin in cold water, then add to the cream, which has been heated. Stir until dissolved, pour on the beaten egg, cook like soft custard, turn into mold and chill.

Ice cream as made at home contains from 15 to 25 per cent carbohydrate.

Ice Cream (Diabetic).

Food.	Amount.	Protein, gm.	Fat, gm.	Carbohydrate, gm.	Calories.
Cream, 40 per cent . .	90 cc	3	36	3	348
Water	10 cc				
Egg (1)	50 gm.	6	6	..	78
Saccharin (to sweeten), Flavoring (to taste)					
		9	42	3	426

Make a soft custard of the egg, 50 cc of the cream, and the water. Whip the remaining 40 cc of cream and fold into custard. The saccharin may be added to the egg. The flavoring should be added last.

See also pages 152 and 153.

Cracked Cocoa.—Cracked cocoa (cocoa nibs) makes a most useful drink for diabetic patients. This is not generally appreciated by the profession.

The sample of cracked cocoa (cocoa nibs) used has been purchased of the S. S. Pierce Company, Boston. It was analyzed by Professor Street, with the following result:

Moisture	.283
Protein	14.69
Fat	51.42
Fiber	4.32
Ash	3.88
Starch	7.48
Reducing sugar, as dextrose direct	None
Reducing sugar, as dextrose after inversion	0.94

The cocoa is prepared for the table by adding a cupful of the cracked cocoa to a quart of water and letting it simmer on the back of the stove all day, adding water from time to time. The strained infusion alone should be taken and not the nutritious grounds or nibs. Professor Street was good enough to analyze the infusion, and wrote me: "The cocoa prepared according to directions contained 0.032 per cent of reducing sugar as dextrose direct and 0.138 per cent of total reducing sugars."

Cocoa shells are extensively used as a beverage. On cup of cocoa shells to a quart of water should be used, allow to simmer at least one-half hour. Drink the strained infusion. Cocoa shells are far cheaper than cocoa nibs.

Desserts can often be made with gelatin and this may be flavored with coffee, lemon, rhubarb, or cracked cocoa. In preparing such desserts if saccharin is used it should be added as late as possible during the cooking for it is apt to become bitter with heat. It is always a safe rule to add too little rather than too much saccharin.

Extracts.—In making agar jelly, gelatin and other desserts, flavoring extracts can be used. The general rule is one teaspoonful of extract to a pint of liquid. The standard extracts and vegetable colorings can be employed. We frequently use sugar-free extracts which are made by Emma Hall[1] and

[1] Woman's Baking Company, 172 Harvard Avenue, Allston, Mass.

known to be sugar-free. Some patients overindulge in the use of extracts by putting a teaspoonful in every cup of cocoa shells or coffee that they drink as well as by increasing the amount allowed in recipes. This should be avoided.

Sea moss farina and Irish moss are usually allowable for diabetic patients. Most of the carbohydrate in these materials is in the form of pentosans and galactans, which Swartz[1] has shown to be quite inert in the body. Unfortunately these products are sometimes adulterated with other carbohydrates. This emphasizes the fact that no matter how useful a food may be in itself, one must always be on the lookout for adulteration.

Agar-agar Jelly.

Agar-agar (powdered) 1 teaspoonful.
Water, strained cocoa shells, or coffee, $1\frac{1}{2}$ pints.
Flavoring extract 1 teaspoonful.

Mix agar with a little of the water until it forms a smooth paste. Add rest of water and boil ten minutes. Strain, flavor, color and sweeten with saccharin as desired. Pour into molds and cool at room temperature.

Lemon Jelly (Diabetic).

Food.	Amount.	Protein, gm.	Fat, gm.	Carbohydrate, gm.	Calories.
Lemon juice	30 cc	..	..	3	12
Water	50 cc				
Gelatin	4 gm.	4	..	..	16
Saccharin (to sweeten)					
Cream	30 cc	1	12	1	116
		5	12	4	144

Soften gelatin in a part of the cold water. Heat the remaining water and lemon juice and pour over the gelatin. Stir until dissolved. Add saccharin, strain into cups. Serve with cream.

Lime juice is used in flavoring. One teaspoonful in a glass of water makes a good beverage in hot weather. One must be very sure that the lime juice is free from sugar or contains but a trace.

[1] Swartz: Tr. Conn. Acad. Arts and Sci., 1911, **16**, 247.

The proper seasoning of the food is a great help to the diabetic patient. So many articles are excluded from the diet that the great variety which is possible in the preparation of the food by the help of seasoning is overlooked. Horseradish, to be sure, contains 10 per cent of carbohydrate, but it would take at least 2 teaspoonfuls to contain a gram, and probably far more. Sour pickles are allowable, and other pickles made from the group of 5 per cent vegetables, provided one is assured that they have been prepared without sweetening. Mint, capers, curry, tarragon vinegar, distilled vinegar, bay leaf, cloves, ginger, mustard, paprika, anise seed, caraway seed, celery salt and onion extract may all be used as seasoning.

Five per cent vegetables furnish the bulk of a diabetic patient's diet and their variety leaves little chance for monotony. Lettuce, endive, chickory and water cress combined with other fresh vegetables furnish salad all the year round. Cabbage is inexpensive and very good. White, green, red, or Chinese cabbage chopped finely, served cooked or raw as cold slaw, may be used. Greens, chopped, can be blended in cooking as, for example, Abyssinian, senel and chard, Chinese mustard and spinach. For the last few years we have used lettuce instead of washed vegetables. It has but 2 per cent carbohydrate and is more palatable in the end. One patient, before insulin days, for over a year took 600 grams daily.

Miss McCullough suggests that large outer stalks of cauliflower, slightly green covering, be carefully cleaned, cut in half-inch pieces and boiled until tender. Similarly, green leaves and any small pieces of lettuce may be shredded and served as spinach. The flat, large, celery stalks with any or all leaves chopped finely answer well. Rhubarb retains its acid flavor and has proven so acceptable an addition to the diet that canning it by cold water method for future use should be encouraged.

Diabetic patients should be urged whenever possible to have a garden. This, too, enables a patient to can his own winter's supply of vegetables and the chance to enjoy a

variety of vegetables during the winter which otherwise could not be obtained.

At the New England Deaconess Hospital we have seldom found trouble with canned vegetables but it is quite advantageous to use those put up especially for diabetics without the addition of sugar or salt. (See p. 190.) The small stringless beans with practically no bean in them at all are perfectly safe for general use as a 5 per cent vegetable. One must always be careful in using canned vegetables because of sugar which may have been added.

Seven Menus for a Severe Diabetic.—For menus, and recipes which make them possible, I am greatly indebted to Miss Alice Dike, Instructor in Household Economics at Simmons College, to Case No. 765, and to Miss Sigrid Kenseth who has revised the original recipes to make them applicable to present day needs. The carbohydrate is designedly kept low because it is an easy matter to add to it. Similarly with more carbohydrate, more caloriescan be given in the form of fat. The ketogenic-antiketogenic balance is 1.2 and thus safe for an individual weighing 50 kilograms who while living upon it so regulates his activity that weight is neither gained nor lost.

The calories furnished amount to about 1400—a maintenance diet for a patient weighing about 50 kilograms and a sufficient diet for a patient who leads a quiet life.

A Three Standard Hospital Diets and Its Arrangement in Three Forms.

	Grams.	Carbohydrate.	Protein.	Fat.	Calories.
Oatmeal	15	10	3	1	
Orange	200	20	0	0	
5 per cent vegetables	600	20	10	0	
Meat	60	0	16	10	
Eggs	2	0	12	12	
Bacon	30	0	5	15	
Butter	30	0	0	25	
20 per cent cream	240	8	8	48	
		58	54	111	1441[1]

[1] The patient is an adult. Weight, 50 kilograms. If fat in the cream is 40 per cent the calories would amount to 1873.

DIET I.

Breakfast.	*Dinner.*	*Supper.*
Egg omelet . 1	Steak . . . . 60 gm.	Egg poached . . 1 gm.
Bacon . . . 15 gm.	Lettuce and tomato salad with mayonnaise . 100 "	Bacon . . . . 15 gm.
Oatmeal . . 15 "	String beans . . 100 "	Stewed tomatoes . 150 "
20% cream . 80 cc	Cabbage . . . 100 "	Asparagus . . 150 "
Butter . . . 10 gm.	20% cream . . 80 cc	20% cream . . 80 cc
Grapefruit . . 100 "	Orange . . . 75 gm.	Butter . . . . 10 gm.
Coffee, bran.	Cellu bran, coffee agar jelly, tea, bran.	Grapefruit . . 150 "
		Bran,
		Lemon agar jelly, cocoa shells.

DIET II.

Breakfast.	*Dinner.*	*Supper.*
Scrambled egg . 1	Chicken . . . 60 gm.	Soft boiled egg with mayonnaise 1
Bacon . . . 15 gm.	Cauliflower . . 150 "	Bacon . . . . 15 gm.
Shredded wheat ½ "	Brussel sprouts . 180 "	Swiss chard . . 180 "
20% cream . 80 cc	Lettuce . . . 30 " with cucumber . 60 "	Celery . . . . 30 "
Butter . . . 10 gm.	Butter . . . 15 "	Lettuce . . . 30 "
Orange . . . 50 "	20% cream . . 80 cc	20% cream . . 80 cc
Coffee, bran.	Grapefruit . . 100 gm.	Strawberries . . 150 gm.
	Bran, cocoa shells, maple agar jelly.	Tea, bran.

DIET III.

Breakfast.	*Dinner.*	*Supper.*
Bacon . . . 30 gm.	Cod fish . . . 60 gm.	Eggs 2
Oatmeal . . 30 "	Bacon . . . 20 "	Chopped raw cabbage with diabetic mayonnaise . 60 gm.
20% cream . 100 cc	Stewed tomato . 150 "	Spinach . . . 150 "
Butter . . . 15 gm.	Boiled onion . . 90 "	Butter . . . 10 "
Bran, coffee	Radish . . . 20 "	Orange, sliced . 100 "
	Lettuce . . . 40 " with grapefruit salad . . . 100 "	Cocoa shells
	20% cream . . 60 cc	Bran.
	Butter . . . 15 gm.	
	Lemon and lime agar jelly	
	Bran, coffee.	

Squab.—A squab when carefully boned yields 50 grams of meat. This is broiled in an oiled paper case to prevent evaporation, and when served with the escaped juices proves a favorite dish for patients. It contains about 12 grams protein

and 5 grams fat. The lean part of a lamb chop yields about 30 grams of meat.

Boiled Dinner.—Corned beef, with cabbage and one other vegetable, served together as a boiled dinner, is most acceptable to male patients. A portion containing 50 to 75 grams of meat and 100 grams of each vegetable makes an excellent meal. Corned beef hash made of meat and vegetables in the same proportion could also be served for variety.

Diabetic Menus for a Week.

(Prepared by Miss Sigrid Kenseth, R. N., of the New England Deaconess Hospital.)

MONDAY.

Total Diet for the Day.

	Grams.	Carbohydrate.	Protein.	Fat.
Bacon	30	0	5	15
Egg (1)	..	0	6	6
Chicken	45	0	12	5
Meat	45	0	12	8
40 per cent cream	150	5	5	60
Grapefruit	200	10	0	0
Lettuce	50	1	1	0
5 per cent vegetables	420	14	7	0
Butter	30	0	0	25
		30	48	119

Breakfast.

1 egg with tomato, scrambled	60 gm.	40 per cent cream with coffee	40 cc
Bacon	30 "	Butter	5 gm.
Grapefruit	140 "		

Total: Carbohydrate, 10; protein, 13; fat, 41.

Lunch.

Salad with mayonnaise:		Baked stuffed tomato:	
Chicken	45 gm.	Butter	5 gm.
Celery	60 "	Tomato	90 "
Lettuce	60 "	Celery	30 "
		Onion	15 "

Raspberry jelly with 40 per cent cream, whipped . . . 55 cc
Butter . . . . . 5 gm.
Tea and 40 per cent cream . . . . . 10 cc

Total: Carbohydrate, 10; protein, 19; fat, 39.

Dinner.

Meat pie:
- Meat . . . . . 45 gm.
- Tomato . . . . . 60 "
- Cauliflower . . . . 90 "

Butter . . . . . 15 gm.
Coffee ice cream (40 per cent cream) . . . . 45 cc
Grapefruit . . . . . 60 gm.

Total: Carbohydrate, 10; protein, 16; fat, 39.

TUESDAY.

Total Diet for the Day.

	Grams.	Carbohydrate.	Protein.	Fat.
Eggs (2)	. . . . .	0	12	12
Strawberries	75	5	0	0
Triscuit	1	7	1	0
Bacon	30	0	5	15
Cheese	15	0	4	6
40 per cent cream	120	4	4	48
Meat	60	0	16	10
5 per cent vegetables	360	12	6	0
Butter	35	0	0	29
Lettuce	100	2	1	0
		30	49	120

Breakfast.

Dropped egg on toasted Triscuit with:
- Butter . . . . . 5 gm.
- Bacon . . . . . 30 "

40 per cent cream with coffee . . . . . 30 cc
Bran,
Butter . . . . . 5 gm.

Total: Carbohydrate, 8; protein, 13; fat, 41.

Lunch.

Cheese omelet:
- Cheese . . . . . 15 gm.
- Egg (1)

Fried egg plant . . . 180 "
Butter . . . . . 5 "

Salad with mayonnaise:
- Lettuce . . . . . 50 gm.
- Cucumber . . . . . 30 "
- Tomato . . . . . 30 "

Lemon Bavarian Cream (40 per cent cream) . . . . 50 cc
Bran with butter . . . . . 5 gm.
Tea

Total: Carbohydrate, 11; protein, 16; fat, 40.

Dinner.

Meat (croquettes) . . . 60 gm.
Tomato sauce:
- Butter . . . . . 5 "
- Tomato . . . . . 30 "

Lettuce with French dressing . . . . . 50 gm.
Cauliflower . . . . . 90 "
Butter . . . . . 10 "
Strawberries . . . . 75 "
with cream (40 per cent) 40 cc

Total: Carbohydrate, 11; protein, 20; fat, 39.

WEDNESDAY.

Total Diet for the Day.

	Grams.	Carbohydrate.	Protein.	Fat.
Bacon	30	0	5	15
Lettuce	100	2	1	0
Egg and white (1)	..	0	9	6
Oatmeal	10	7	2	1
Olive oil	10	0	0	10
Butter	30	0	0	25
40 per cent cream	120	4	4	48
Chicken	45	0	12	5
Meat	45	0	12	8
5 per cent vegetables	300	10	5	0
Grapefruit	140	7	0	0
		30	50	118

Breakfast.

Oatmeal . . . . . 10 gm.
1 egg, egg-white (egg in nest) . . . . . 1 "
Bacon . . . . . 20 "
40 per cent cream . . . 40 cc
Butter . . . . . 10 gm.
Grapefruit . . . . . 40 "
Bran wafers 2
Coffee

Total: Carbohydrate, 10; protein, 15; fat, 41.

Lunch.

40 per cent cream with clam broth . . . . . 20 cc
Club sandwich:
Chicken . . . . . 45 gm.
Lettuce . . . . . 50 "
Tomato . . . . . 90 "
Bacon . . . . . 10 "
Butter . . . . . 15 "
Bran with mayonnaise, 40 per cent cream . . 20 cc
Cocoa shells,
Bran wafers 2
Grapefruit . . . . . 100 gm.

Total: Carbohydrate, 10; protein, 17; fat, 39.

Dinner.

Cream asparagus soup:
Butter . . . . . 5 gm.
40 per cent cream . . 30 "
Asparagus. . . . . 90 "
Mocha whip
Coffee with 40 per cent cream : . . . . . 10 cc
Cellu-bran wafers . . . 2
Veal . . . . . 45 gm.
Brussel sprouts . . . . 120 "
Lettuce . . . . . 50 "
French dressing:
Olive oil . . . . . 10 cc
Vinegar . . . . . 10 "

Total: Carbohydrate, 10; protein, 18; fat, 38.

THURSDAY.

Total Diet for the Day.

	Grams.	Carbohydrate.	Protein.	Fat.
Chicken	45	0	12	5
Corned beef	60	0	16	10
Liver Bacon	30 30	0	11	17
5 per cent vegetables	300	10	5	0
40 per cent cream	150	5	5	60
Butter	45	0	0	37
Grapefruit	200	10	0	0
Orange	30	3	0	0
		28	49	129

Breakfast.

Grapefruit . . . . . 140 gm.
Liver . . . . . 30 "
Bacon . . . . . 30 "
Butter . . . . . 10 gm.
40 per cent cream . . . 30 cc
Bran, coffee.

Total: Carbohydrate, 8; protein, 12; fat, 42.

Lunch.

Chicken à la King:
Chicken . . . . . 45 gm.
40 per cent cream . . 50 cc
Butter . . . . . 10 gm.
Green pepper . . . 15 "
Pimento . . . . . 15 "
Mushrooms . . . . 60 "
Cold slaw . . . . . 60 gm.
Sliced
Orange . . . . . 25 "
Grapefruit . . . . 60 "
40 per cent cream with cocoa shells . . . . 10 cc
Butter . . . . . 5 gm.
Bran

Total: Carbohydrate, 11; protein, 17; fat, 42.

Dinner.

Broth
Boiled dinner:
Corned beef . . . . 60 gm.
Cabbage . . . . . 120 "
Turnip . . . . . 60 "
Butter . . . . . 10 gm.
Cocoa Blanc Mange,
Cream . . . . . 60 cc

Total: Carbohydrate, 10; protein, 21; fat, 42.

FRIDAY.

Total Diet for the Day.

	Grams.	Carbohydrate.	Protein.	Fat.
Bacon	40	0	7	20
Orange	90	9	0	0
5 per cent vegetables	450	15	8	0
Lettuce	100	2	1	0
Olive oil	10	0	0	10
Butter	45	0	0	38
40 per cent cream	120	4	4	48
Fat fish	60	0	12	6
Fish (haddock)	90	0	18	0
10		30	50	122

Breakfast.

Orange . . . . . 90 gm.
Bacon . . . . . 40 "
40 per cent cream . . . 30 cc
Butter . . . . . 10 gm.
Bran, coffee.
Total: Carbohydrate, 10; protein, 8; fat, 40.

Lunch.

Fish chowder:
Haddock . . . . . 90 gm.
40 per cent cream . . 45 "
Onion . . . . . 30 "
Butter . . . . . 10 "
Stuffed tomato salad:
Tomato . . . . . 90 "
Lettuce . . . . . 50 "
Cucumber and celery . 60 "
Maple whip with 40 per cent cream . . . . 15 cc
Butter . . . . . 10 gm.
Bran, tea or cocoa shells.
Total: Carbohydrate, 10; protein, 24; fat, 41.

Dinner.

Tomato bouillon:
Tomato . . . . . 60 gm.
Butter . . . . . 5 "
Mackerel (broiled) . . . 45 "
with melted butter . . 10 "
Endive . . . . . 50 "
Greens . . . . . 150 "
Celery . . . . . 30 "
French dressing:
Olive oil . . . . . 10 gm.
Vinegar . . . . . 10 "
Pineapple jelly with 40 per cent cream, whipped . 30 cc
Total: Carbohydrate, 10; protein, 18; fat, 41.

SATURDAY.

Total Diet for the Day.

	Grams.	Carbohydrate.	Protein.	Fat.
Eggs (2)	. . . . .	0	12	12
Meat	60	0	16	10
Bacon	30	0	5	15
Sardines	30	0	7	6
40 per cent cream	120	4	4	48
Butter	35	0	0	29
5 per cent vegetables	390	13	7	0
Strawberries	75	5	0	0
Grapefruit	160	8	0	0
		30	51	120

Breakfast.

Griddle cakes (1 egg) with substitute maple syrup,
Grapefruit . . . . . 160 gm.
Butter . . . . . 15 "
Bacon . . . . . 20 gm.
Cream (40 per cent) . . 30 cc
Coffee
Total; Carbohydrate, 9; protein, 10; fat, 41.

Lunch.

Tomato bisque:
- 40 per cent cream . . 40 cc
- Tomato . . . . . 120 gm.
- Butter . . . . . 5 "

Sardines . . . . . 30 "
Swiss chard . . . . . 120 "
Butter . . . . . 5 gm.
Bran,
Sponge cake ($\frac{1}{2}$ egg),
40 per cent cream . . . 10 cc
Cocoa shells

Total: Carbohydrate, 10; protein, 16; fat, 39.

Dinner.

Broth,
Steak . . . . . 60 gm.
Bacon . . . . . 10 "
Cauliflower . . . . . 60 "
Mushrooms . . . . . 90 "
Strawberry shortcake:
- Sponge cake ($\frac{1}{2}$ egg),
- Strawberries . . . . 75 "
- 40 per cent cream, whipped . . . . 40 cc

String beans . . . . 90 gm.
Lettuce salad with mayonnaise,
Butter . . . . . 10 "
Bran

Total: Carbohydrate, 11; protein, 25; fat, 42.

SUNDAY.

Total Diet for the Day.

	Grams.	Carbohydrate.	Protein.	Fat.
Egg (1)	. . . . .	0	6	6
Oysters (6)	. . . . .	4	6	1
Meat	90	0	24	15
Oil	15	0	0	15
5 per cent vegetables	450	15	6	0
10 per cent vegetables	45	3	3	0
Grapefruit	80	4	0	0
40 per cent cream	120	4	4	48
Butter	30	0	0	25
Bacon	20	0	3	10
		30	52	120

Breakfast.

Grapefruit . . . . . 80 gm.
Corned beef and vegetable hash:
- Bacon . . . . . 20 "
- Corned beef . . . . 45 "
- Cabbage . . . . . 60 "
- Beets . . . . . 45 "

40 per cent cream . . . 30 cc
Butter . . . . . 10 gm.
Coffee, bran.

Total: Carbohydrate, 10; protein, 18; fat, 38.

Lunch.

Oyster stew:
- Oysters (6),
- 40 per cent cream . . 60 cc
- Butter . . . . . 10 gm.

Egg salad:
- Egg 1
- Lettuce . . . . . 30 gm.
- Mayonnaise

Asparagus . . . . . 90 gm.
40 per cent cream . . . 10 cc
Lemon and lime jelly.

Total: Carbohydrate, 10; protein, 16; fat, 43.

Dinner.

Roast lamb with mint sauce 45 gm.
String beans (canned) . . 150 "
Butter . . . . . 10 "
Sliced cucumber . . . 30 "

French dressing:
- Olive oil . . . . . 15 cc
- Vinegar . . . . . 10 "

Rhubarb (pie) . . . . . 90 gm.
40 per cent cream . . . 20 cc
Coffee

Total: Carbohydrate, 10; protein, 18; fat, 39.

Recipes for Daily Menus.

Broths.—Each pound of beef, veal, chicken or lamb, or 1 pint of clams, should make 1 quart of broth. Let cool, and skim off all fat before serving.

Bouillon.—Bouillon cubes are not advisable because of their high salt content.

Salt:
- Armour's . . . . . 21 per cent
- Steero . . . . . 39 "
- Oxo . . . . . 62 "

Tomato Bouillon.
- Tomato . . . 60 gm.
- Broth . . . . 1 cup
- Onion extract . . ½ teaspoonful
- Bay leaf . . . ½
- Clove 1
- Celery salt or celery tops . . . . ¼ teaspoonful

Mix all ingredients, boil twenty minutes, strain and serve.

Squash Gingerbread.
- Vegetable marrow (cooked and mashed) . . . 180 gm.
- Butter . . . . . 20 "
- Egg-white 1
- Ginger . . . . . 1 tablespoonful
- Cream . . . . . 60 cc
- Salt and saccharin to taste.

Flavor vegetable marrow with salt, melt butter and add it to vegetable, also add ginger. Beat egg and add to mixture. Spread ¼ inch thick and bake for one and a quarter hours in moderate oven. Serve hot with 60 cc of cream whipped stiff and flavored with saccharin.

Food value: Carbohydrate, 8; protein, 11; fat, 28.

Bran Cookies.

Washed bran	2 cups
India gum	1 tablespoonful
Mineral oil	1 "

Salt and saccharin to taste.

Ginger, cloves, anise, or caraway seed, ½ teaspoonful, if desired.

Mix dry ingredients and then add bran and mineral oil with enough water to make a stiff dough. Knead with finger tips. Pat out and cut into thin cookies. Bake about forty-five minutes in a moderate oven until crisp.

Cellu-bran Cookies.

Washed bran	2 cups
Cellu-flour	½ cup
India gum	1 tablespoonful
Spice	1 teaspoonful
Mineral oil	1 tablespoonful

Salt and saccharin to taste.

Mix as bran cakes and bake in moderate oven, being careful not to brown cookies.

Cellu-flour Cookies.

Cellu-flour	2 cups
India gum	1 tablespoonful
Flavoring extract or spice	1 teaspoonful

Salt and saccharin to taste.

Mix and bake as above.

Cellu-flour Pie Crust.

Cellu-flour	2 tablespoonfuls
India gum	1 teaspoonful

Salt and enough water to make a stiff dough.

Mix with finger tips and shape pie crust as desired before baking, bake in a moderate oven, being careful not to brown.

Cellu-flour Sponge Cakes.

Egg	1
Water	1 tablespoonful
Extract	½ teaspoonful
Cellu-flour	1–1½ tablespoonfuls

Beat white and yolk of egg separately. To the yolk add water, extract, salt and saccharin. Then add cellu-flour from 1 to 1½ tablespoonfuls, according to the consistency of the yolk. When the mixture is almost brittle add the egg-white, being careful not to beat in too thoroughly. A pinch of baking powder may be used if desired. Bake in a quick oven about fifteen minutes.

Variations.—With strawberries and whipped cream, as allowed in diet, a shortcake can be made; 15 gm. of nuts chopped may be added if allowed in diet, or 30 gm. of blueberries if desired.

Cellu-flour Griddle Cakes.

Egg	1
Water	1 tablespoonful
Cellu-flour	1–2 tablespoonfuls

Salt and saccharin to taste.

Beat white and yolk of egg separately and together add water and cellu-flour, enough to make a fairly firm mixture, salt and saccharin. Fry on a hot griddle and serve with butter allowed in diet or a substitute maple syrup.

Food value: Carbohydrate, 0; protein, 6; fat, 6.

Substitute Maple Syrup.

Water	1 cup
India gum	½ teaspoonful
Maple extract	1 "
Saccharin	

Mix gum with a little water and then gradually add the remainder of cup, beating with an egg-beater until all lumps are removed. Add flavoring, saccharin and extract; serve hot.

Candy.

Agar-agar	4 teaspoonfuls
Water	1000 cc
Flavoring (wintergreen, peppermint, spearmint or vanilla).	

Dissolve agar in water. Bring to a boil and boil twenty minutes. Cool after adding flavoring and saccharin and cut in squares.

Cheese Custard.

Egg	1
Milk	120 cc
Grated cheese	10 gm.

Beat egg, add pinch of salt, milk and cheese. Beat and bake as two custards in a pan of water in oven.

Cream	60 cc
Water (may be used if milk is not allowed in diet)	30 "

Food value with milk: Carbohydrate, 6; protein, 13; fat, 14.
Food value with cream: Carbohydrate, 2; protein, 8; fat, 18.

Cheese Salad.

Cream cheese	15 gm.
Pimento	10–15 "

Dice pimento and mix with cheese allowed. Shape into small balls and serve on lettuce, 25 gm.

Food value: Carbohydrate, 1; protein, 5; fat, 5.

Irish Moss Blanc Mange.—Soak small amount of moss in cold water ten minutes. Pour off water and add to moss 60 cc of 40 per cent cream and 120 cc of cocoa shell liquid. Bring to boil and boil until a drop jellies on a cold plate. Then flavor with vanilla, ½ teaspoonful, and saccharin. Strain and mold.

Custard.

Egg	1
Cream	60 cc
Milk	120 "
or	
Cream	60 "
Water	120 "
Flavoring, saccharin, nutmeg if desired.	

Best egg thoroughly, add cream, milk, etc. Bake as two custards in a pan of water. Any combination of milk and cream if figured correctly may be used.

Food value of each custard with milk: Carbohydrate, 4; protein, 6; fat, 11.

Food value of each custard with water: Carbohydrate, 1; protein, 4; fat, 9.

Agar-Agar Jelly.

Agar-agar (powdered)	1 teaspoonful
Water, strained cocoa shells, or coffee	1½ pints
Flavoring extract	1 teaspoonful

Mix agar with a little of the water until a smooth paste. Add rest of water and boil ten minutes. Strain, flavor, color and sweeten with saccharin as desired. Pour into molds and cool at room temperature.

Suggestions:

Vanilla	1 teaspoonful	Mapleine	1 "
Lemon	1 "	Coffee	1 cup
Orange	1 "	Cocoa shells	1 "
Lime	1 "	Peppermint	½ teaspoonful
Raspberry	1 "	Wintergreen	½ "
Strawberry	1 "	Spearmint	½ "
Pineapple	1 "		

Gelatin.—One teaspoonful gelatin to 2 cups of hot water dissolved may be added to 1 teaspoonful of any of the above extracts and saccharin to taste. Gelatin is used very little because of high protein content. Gelatin may be used when agar-agar is too laxative.

Bavarian Cream.—To any of the extracts suggested, when just beginning to jell, beat in whipped cream allowed in diet.

Whips.—To any jellies, when partially jelled, beat in beaten white of egg. Cocoa and coffee together make a mocha whip.

Coffee Spanish Cream.—Dissolve ½ teaspoonful of gelatin in 5 tablespoonfuls of coffee. Pour this on beaten yolk of egg. Add 60 cc of cream and 60 cc of milk, saccharin. Cook as soft custard and when thick add to beaten white of egg. This makes two creams. Chill and mold on ice.

Food value of one cream: Carbohydrate, 2.5; protein, 5; fat, 10.

Spanish Cream.—Use maple, vanilla or other extract and dissolve gelatin in hot water instead of coffee, or use hot cocoa shells instead of hot coffee.

Pudding.

Vegetable marrow or cauliflower	180 gm.
Egg	1
Cream	60 cc

Butter, if desired.

Food value without butter: Carbohydrate, 8; protein, 11; fat, 18.

Snow Pudding.

Lemon juice	1 teaspoonful
Gelatin	1 "
Saccharin	2 grains
Boiling water	½ cup

1 egg-white beaten stiff.

Dissolve gelatin in ½ cup of boiling water, add lemon juice, saccharin. When partly jelled add beaten egg-white. Beat thoroughly and cool.

Food value: Carbohydrate, 1; protein, 3; fat, 0.

Peach Snow Pudding.

Peaches cooked . . . . . 75 gm.

Remove peaches from juice. Dissolve in the juice 1 teaspoonful of gelatin. Add enough boiling water to make 1 cup. Add small amount of pink coloring. When partially jelled beat with an egg-beater until light and frothy. Then stir in peaches.

Food value: Carbohydrate, 10; protein, 0; fat, 0.

Custard Sauce (for any desserts).

Cream or milk . . . . . 30 cc
Egg-yolk . . . . . ½ (saccharin)
Water . . . . . 2 tablespoonfuls

Cook as a soft custard, cool and serve.

Food value with milk: Carbohydrate, 1; protein, 4; fat, 4.

Food value with cream: Carbohydrate, 1; protein, 4; fat, 9.

Ice Cream.

Cream . . . . . 60 cc
Milk . . . . . 60 "
Egg . . . . . 1 "
Saccharin and flavoring.

Beat as an egg-nog and freeze. More milk and cream may be added to make enough for two meals, or cream may be used entirely if milk is not allowed in diet.

Food value: Carbohydrate, 5; protein, 10; fat, 20.

Coffee Ice Cream.

Coffee . . . . . 1 cup
20 per cent or 40 per cent cream . . . . . 45–60 cc
India gum . . . . . 1 teaspoonful
Saccharin to taste.

Dissolve India gum in a little water, add coffee, beat and boil until a smooth consistency. Add cream and saccharin. Put mixture in small saucepan. Place in larger pan of salt and ice. Stir from time to time until mixture freezes and is smooth. Cocoa shells may be used in the same way instead of coffee if desired.

Mousse.—Can be made with strawberries or peaches.

Cream (30 per cent) . . . . . 150 cc
Peaches . . . . . 110 gm.
or
Strawberries . . . . . 165 "
Egg-whites (1 egg-white is sufficient) . . . 2
Gelatin . . . . . 1 teaspoonful
Saccharin to taste.

Dissolve gelatin in 1 teaspoonful cold water. Heat 2 tablespoonfuls of cream and put with gelatin and water. Place in pan of water. Whip the rest of the cream and saccharine together. Whip 2 egg-whites. Add gelatin mixture to whipped cream and then add egg-whites. Put mixture in a mold and place in ice-chest for an hour.

Food value: Carbohydrate, 16; protein, 14; fat, 45.

Ice Cream.

1.

Cream (30 per cent) . . . . . 150 cc
Saccharin to taste.

Whip cream. When moderately well whipped flavor with diabetic vanilla and continue whipping until stiff. Put mixture into mold, pack in salt and ice and leave for from two to three hours. This makes a light, fluffy and quite bulky ice cream.

Food value: Carbohydrate, 8; protein, 8; fat, 45.

2.

Use quantity of cream allowed, diluting with milk if desired.
Flavor with saccharin and vanilla.
Egg, 1, if desired.

Freeze as ordinary ice cream. This makes a less bulky ice cream.

3.

Cream (30 per cent), 120 cc, or quantity allowed for one person.
Saccharin to taste.

Place mixture in bowl. Place bowl in a larger bowl of ice. Whip the cream. Dissolve some George Washington coffee in cold water. Add this to cream and whip until stiff. Add salt to top of ice and put in cold place for one and a half hours. Three times in first fifteen minutes after setting to cool stir mixture with spoon so it will be smooth and not stick to sides of bowl.

Food value for 120 cc cream: Carbohydrate, 6; protein, 6; fat, 36.

4.

Cream (30 per cent), 120 cc, or quantity allowed for one person.
Saccharin and flavoring to taste.

Put mixture in open dish and place in larger dish full of ice and salt. Keep cream there for about two hours, stirring every few minutes with spoon so that the outside will not freeze hard and the inside remain soft.

Food value with 120 cc cream: Carbohydrate, 6; protein, 6; fat, 36.

Blueberry Pie.

Cooked cereal, using quantity allowed in diet.
Blueberries, using quantity allowed in diet, see pp. 76 .
Egg, 1.
Butter and cream as allowed.

This may be made with vegetable marrow instead of cereal.

Rhubarb Pie.—Stew rhubarb, 90 gm., in $\frac{1}{4}$ cup of water. Thicken with $\frac{1}{4}$ teaspoonful of India gum. Cool, sweeten with saccharin and put in crust which has been previously baked.

Other fillings may be made the same way, using more India gum if necessary.

		Carbohydrate.
Cranberries	30 gm.	3
Blueberries	65 "	10
Peach	75 "	10

Dessert.—Grate very finely the allowance of Brazil nuts and mix with the allowance of grapefruit. This makes a very pleasing dessert.

If desired 1 tablespoonful of lime juice may be added to the quantity of grapefruit allowed. This makes a change in dessert.

Suggestions:

Eggs.

Fried
Broiled
Scrambled—onion, chives, parsley
Omelet—plain or with asparagus, 60 gm.
Baked
Hard boiled served with spinach
Hard boiled in salad
Scrambled with tomato
Baked in tomato with cheese on top
Stuffed eggs
Dropped eggs
Ham omelet
Egg with dried beef
Spanish omelet

Cheese Omelet.—Beat white and yolk of 1 egg separately. Add to yolk 15 gm. of grated cheese, pinch of salt and 1 teaspoonful of water. Fold in white of egg. Beat stiff. Bake in oven until a golden brown.

Food value: Carbohydrate, 0; protein, 10; fat, 12.

Egg in Nest.—Beat white of 1 egg with a little salt until very stiff. Drop on a tin greased with mineral oil and sink whole yolk into the center of the white. Bake in a quick oven about five minutes until brown.

Tomato Sauce.

1 can of tomatoes. Note the weight.
1 onion and curry powder to taste.

Boil down until right consistency. This may be served as a vegetable, or with eggs, or with an omelet.

Scrambled Egg and Tomato.

Egg 1
Tomato . . . . . 60 gm.

Beat white and yolk separately with a little salt and fold in together. Put into frying pan greased with mineral oil. Cook one minute then add 60 gm. cooked tomato pulp, stirring with a fork until done.

Food value: Carbohydrate, 2; protein, 7; fat, 6.

Fat-free Fish.	**Fat Fish.**	**Canned Fish.**
Cod	Mackerel	Salmon
Haddock	Sword fish	Tuna
Finnan haddie	Smelts	
Flounder	Fresh salmon	
Salt cod	Trout	
Lobster	Halibut, etc.	
Shrimp		

Meat, 30 gm., equals { Fat-free fish, 30 gm. or Fish, 40 gm. / Bacon, 10 " Butter, 6 "

Meat, 30 gm., equals Fat fish, 30 gm.

Meat, 30 gm., equals { Canned salmon, 30 gm. / Canned tuna, 30 "

Fish Chowder.

40 per cent cream	45 cc
Fish	90 gm.
Onion	40 "
India gum	1 teaspoonful
Salt,	
Parsley.	

Cut fish in small pieces and cook with finely chopped onion. Strain and thicken with ½ teaspoonful of India gum, add to onion and fish. Add parsley and salt. Lastly, add cream and heat in a double boiler. Butter may be added if desired.

Food value with milk (60 cc): Carbohydrate, 5; protein, 21; fat, 2.

Food value with 20 per cent cream (60 cc): Carbohydrate, 4; protein, 22; fat, 12.

Food value with 40 per cent cream (45 cc): Carbohydrate, 3.5; protein, 21.5; fat, 18.

Fish Cakes.

Fish—salt cod—(more according to fish in diet)	30 gm.
Bran	2 teaspoonfuls
India gum	½ teaspoonful
Onion extract, few drops, seasoning.	

Mix all together with enough hot water or broth to shape into a cake. Fry in mineral oil until brown.

Food value: Carbohydrate, 0; protein, 6; fat, 0.

Salt cod soaked overnight and cooked can be used, taking cooked weight.

Creamed Tuna Fish.

Tuna fish	60 gm.
Pimento	50 "
Cream	60 cc

Food value: Carbohydrate, 5; protein, 24; fat, 29.

Meat.—Any lean meat can be used in a diabetic diet, pork being the only meat in which it is hard to differentiate the fat.

Meat Pie.

Meat	45 gm.
Tomato	90 "
Celery	60 "

Food value: Carbohydrate, 5; protein, 15; fat, 8.

Stew all together in one cup of broth. Pour off the broth and thicken in casserole with cellu-flour crust on it. Bay leaf, parsley and mace may be used as flavoring if desired; if diet is so small that it does not permit the use of onion, onion extract may be used, also celery salt.

Thin Stew.—This may be made as above, but use a smaller amount of India gum in thickening. Any combination of vegetable may be used in making either of the above, but the value must be figured out and deducted from diet.

Meat or Chicken Coquettes.

Meat	60 gm.
Washed bran	1 teaspoonful
India gum	½ "
Broth	1 tablespoonful

Onion extract, a few drops.

Mix gum and bran together. Add to meat which has been ground up. Add broth, salt, pepper and onion extract. Shape into two croquettes. Fry in deep mineral oil until golden brown.

Food value: Carbohydrate, 0; protein, 16; fat, 10.

Chicken à la King.

Mushrooms	60 gm.	Green pepper	15 gm.
Chicken	45 "	40 per cent cream	50 cc
Pimento	15 "	Broth	1 cup

Cook chicken, vegetables, broth and cream together one-half hour. Pour off liquid and thicken with ½ teaspoonful of India gum. Add to chicken and vegetables and serve.

Food value: Carbohydrate, 3; protein, 15; food, 36.

Club Sandwich.—Butter four bran wafers with 15 gm. of butter, then, using chicken, bacon, etc., as above, make two sandwiches.

Mayonnaise Dressing.

Yolk of egg	1
Mineral oil	3 cups
Juice of lemon	½
Salt, paprika, mustard to taste,	
Distilled vinegar	1–2 tablespoonfuls

Beat yolk, add lemon juice, mustard, salt, paprika, then oil drop by drop until it is thoroughly worked in, not increasing amount until you are sure it will not separate. Add vinegar to proper consistency. Allow 2 dessertspoonfuls daily.

The following recipes were suggested to me by Mrs. and Miss Leatherbee.

Cooked Greens.

Cabbage	Spinach
Chard	Orach (a variety of spinach)
Beet greens	Mustard greens

Wash greens in several waters and let stand in cold water for an hour. Chop in small pieces and pour on the same fresh boiling water. Cook from eight to twelve minutes. Do not salt until ready to drain. Mustard and chard, when the leaves are quite large, need to boil a little longer.

Combination of Vegetables.

Chopped celery, 1 part

Chopped cabbage, 2 parts.

Boil ten minutes. Drain off water, salt lightly, serve hot, plain, or with butter.

Mustard greens, boiled with spinach, beet greens, chard or orach.

Tomato	1 cup
Boiled cabbage	2 cups

Heat and serve. Canned tomato and okra added to the cabbage makes a change.

Vegetable Soup.

Dice carrots, turnip and onion
Canned peas
Tomatoes
Okra
Canned string beans
Celery

Cook carrots, turnip and onion together until tender, then add the peas and put in double boiler to keep hot. In another kettle cook tomatoes, okra, canned string beans and celery. Weigh out as much as desired of 5 per cent and 10 per cent vegetables and add 1 cup of hot broth.

Boiled Radishes.—Soak radishes in cold water for about an hour, then boil for ten minutes, salt and serve.

Egg Plant.—Egg plant cut in slices ½ inch thick. Sprinkle with a little salt and place in piles under a plate having a weight on top for two hours. Rinse with cold water and dry. Dip each piece into slightly beaten egg, drain and fry in hot spider, greased with mineral oil, until brown. Remove to agate pan and finish cooking in oven.

Boiled Cucumbers.—Peel cucumbers, slice and boil until tender. Mash, season with salt and pepper and serve as summer squash.

Fried Cucumbers.—Peel and cut in slices ½ inch thick. Dip in slightly beaten egg, drain and fry in hot spider, greased with mineral oil, until brown. Bake in oven until tender.

Boiled or Fried Marrow.—Proceed as with cucumbers.

Purslane.—Serve in a salad with French dressing.

French Dressing.

Mineral oil	⅓ cup	Salt	
Distilled vinegar	⅔ cup	Pepper	
Saccharin	¼ grain	Cayenne	

Enough paprika to color.

Mix in a small bottle which can be kept on the ice. Shake well before using.

Tomato Relish.

Tomato	1 cup
Onion juice	1 teaspoonful
Distilled vinegar	1 tablespoonful

Pinch of cloves, ginger, salt and pepper.

Boil until thickened and add ¼ grain saccharin when taken from stove.

Scalloped Tomato.

Tomato	100 gm.
Washed bran	1 tablespoonful

Onion juice, clove, salt and pepper.

Bake this together. Celery can be mixed with the tomato for variety.

Fried Fresh Tomatoes.—Slice the tomato, not peeled, and fry on hot spider, greased with mineral oil, until brown and tender. Tomatoes that are a little underripe hold their shape better than ripe ones.

Cream Soup.

Strained pulp of leeks	120 gm.
Warm water	½ cup
India gum	1 teaspoonful
Cream	30 gm.

Boil the leeks and the warm water in which the India gum has been beaten together.

Add cream, and season lightly with salt and pepper.

Food value: Carbohydrate, 5; protein, 3; fat, 6.

Oil Dressing.—Equal parts of oil and vinegar. Beat with a little ice. Add salt and pepper. Remove ice and serve at once.

Any 5 per cent vegetables or 10 per cent vegetables may be served cold on lettuce, with mayonnaise or French dressing.

Suggestions:

Asparagus	60 gm.
String beans	60 "
String beans, Beets	30 "
Tomato plain	60 "
Tomato stuffed with cucumber, Chopped cabbage	60 "
Cabbage, 60 gm., with green pepper	15 "
Cabbage, 60 gm., with pimento	15 "
Radishes	30 "
Cucumber	30 "
Beets and carrots chopped	60 "
Lobster salad	
Shrimp salad	
Chicken and celery salad	

Stuffed Tomato Salad.—Weigh tomato after scooping inside. Chop up cucumber and celery about 50 gm. Mix together with mayonnaise. Season, refill shell and serve on lettuce leaf. Other vegetables could be used chopped up in place of cucumber and celery.

Chicken Salad.

Chicken (chopped)	45 gm.
Celery (chopped)	60 "

Mix with diabetic mayonnaise and serve on crisp lettuce, 50 gm.

Oyster Stew.

40 per cent cream	60 cc
Oysters	6
Water	1 cup
Butter	10 gm.
Salt, etc.	

Stew oysters in 1 cup of water. Add cream and butter when oysters are cooked. Heat, add seasoning and serve.

Food value: Carbohydrate, 6; protein, 8; fat, 33.

Cream of Asparagus Soup.

Asparagus	90 gm.
40 per cent cream	30 cc
Cold water	1 cup
India gum	½ teaspoonful
Butter	5 gm.

Cook asparagus in water, strain, add water to cream and thicken with India gum, ½ teaspoonful. Put asparagus through sieve, add to the above and serve.

Food value: Carbohydrates, 4; protein, 3; fat, 16.

Cream of Tomato Soup.

Tomato	120 gm.
40 per cent cream	40 cc
India gum	2 teaspoonfuls
Water	½ cup
Butter	5 gm.

Heat tomato, strain and weigh. Mix India gum with cold water. Add cream and beat with turbin beater. Heat in double boiler (salt, cayenne, paprika). Add two mixtures at last.

Food value: Carbohydrate, 5; protein, 3; fat, 20.

Most any combination can be worked out of 20 per cent cream or milk to use in these recipes, when 40 per cent cream is not allowed in diet. Cream of celery and spinach soup are very good.

Gravy.—Thicken 1 cup of broth with ½ teaspoonful of India gum. Beat with a turbin egg-beater until all lumps are removed. Season as desired and serve hot.

Tomato Sauce.

Bay leaf
Tomato } 30 gm. stewed with ¼ cup of hot water.

Strain and thicken with India gum. Season with salt, pepper and a few drops of onion extract. Serve hot.

Vegetables.—Fried Egg Plant.—Cut egg plant in fairly thin slices. Parboil in salted water. Drain off water, dry thoroughly and fry in deep hot mineral oil. Serve with butter.

Stuffed Peppers.

Vegetable marrow	150 gm.
or	
Winter squash	100 "
Meat	60 "
Butter	10 "
Onion, if desired	15 "

Mix together and stuff two moderately sized peppers.

Food value: Carbohydrate, 6; protein, 19; fat, 18, with onion.

Baked Stuffed Tomato.—Weigh tomato, 90 gm., scoop out inside and stew together with celery, 30 gm., onion, 15 gm., butter, 5 gm., bay leaf, salt and pepper. Refill shell and bake in oven fifteen to twenty minutes.

Cold Slaw.—Chop up cabbage finely and mix with diabetic mayonnaise dressing, 1 dessertspoonful. Serve cold.

New England Deaconess Hospital Recipe for Cooking Oatmeal.

Oatmeal	1 cup
Water	4 cups

Bring to boiling-point and steam in double boiler for three hours. Divide cooked weight by 8 to learn the dry weight of the oatmeal. Patients will do well to weigh out 30 gm. of oatmeal they are accustomed to use in their own household and prepare it either as above or according to their own recipe and then determine what this quantity weighs when cooked.

CHAPTER XIX.

FOODS AND THEIR COMPOSITION.

A. DIABETIC FOODS.

The improvement in the treatment of diabetes owes much to the dissemination of knowledge regarding the composition of foods. To the United States Government we are indebted for an excellent monograph by Atwater and Bryant entitled "The Chemical Composition of American Food Materials, Bulletin No. 28, Revised Edition," which was first issued in 1906. This can be purchased by sending ten cents in coin to the Superintendent of Documents, Washington, D. C.

Diabetics everywhere owe a debt of gratitude to Dr. W. A. Orton of the U. S. Department of Agriculture for his earnest endeavor to increase the number of agreeable vegetables. For this purpose he has brought to Washington specimens from all over the world. It is to be hoped that he will shortly publish a monograph giving the results of his work. Already there has appeared an article on the subject.[1] In England, also the subject of gardening and vegetables for diabetics has been seriously considered by Spriggs.[2]

The State of Connecticut, from its Agricultural Experiment Station in New Haven, has also issued excellent special reports on diabetic foods, and from year to year adds analyses of new preparations. So far these have been distributed upon request. Prof. Street formerly and Prof. E. M. Bailey recently who have been intimately concerned in these investigations have been kindness itself not alone to me but to my inquisitive patients.

[1] Orton, W. A.: Am. Jour. Med. Sci., 1921, **162**, 498.

[2] Spriggs, E. I.: Duff House Papers, Henry Frowde, Hodder & Stoughton, London, 1920, **1**, 373.

Whereas the analyses of many so-called diabetic foods are recorded, no special food is recommended. As a matter of fact no special diabetic food is used at the hospital. This is not meant to disparage such foods but to show that they are accessories without which the diabetic can get along very well.

What is a Diabetic Food?—The definition of a "diabetic" food formulated by the Joint Committee on Definitions and Standards is as follows:

"*Diabetic Food.*—Although most foods may be suitable under certain conditions for the use of persons suffering from diabetes, the term 'diabetic' as applied to food indicates a considerable lessening of the carbohydrates found in ordinary products of the same class, and this belief is fostered by many manufacturers on their labels and in their advertising literature. A 'diabetic' food contains not more than half as much glycogenic carbohydrates as the normal food of the same class. Any statement on the label which gives the impression that any single food in unlimited quantity is suitable for the diabetic patient is false and misleading."

Prof. Street very properly lays down the following detailed requirements which a diabetic food should fulfill:

1. It should contain very much less carbohydrate than found in a normal food of the same class—certainly not over half as much.
2. The label should bear a correct statement of the percentages of protein, fat and carbohydrate present.
3. The amounts of the different carbohydrates present should be declared on the label, *i. e.*, starch, sucrose, levulose, lactose, etc.
4. The processes of manufacture should be so standardized that uniformity of composition, within reasonable limits, will be maintained from year to year.
5. No statement should be placed on the label which would give the impression that any food in unlimited quantity is suitable for a diabetic patient.
6. In the advertisements of these foods emphasis should be put on the carbohydrate content rather than on the amount of protein present.

The narrow confines of the diabetic diet have greatly stimulated the manufacture of so-called diabetic foods. These are often serviceable, but are to be employed with discretion. Their use should be discouraged at the beginning of treatment. The patient should never become dependent upon special diabetic foods, for they are often unobtainable, always make him conspicuous, and when he acquires a disgust for foods of this class it is all the harder to abide by the original diet. When the patient buys one of these foods, unfortunately he is often given a list of other diabetic foods and a new diabetic diet list, and confusion in the diet frequently results. The patients under my care who have done best either never use special diabetic foods or only a few varieties.

The high content of protein is one of the most serious drawbacks to diabetic foods. Formerly when it was not realized that from 100 grams protein 58 grams of carbohydrate could be formed, these special foods with low actual carbohydrate content were considered a great boon. Today we look at the matter differently.

B. COMPOSITION OF NORMAL FOODS.

The following food tables were prepared for me under the supervision of Prof. E. M. Bailey of the Connecticut Agricultural Experiment Station situated in New Haven, Connecticut. Prof. Bailey makes the following comments upon Tables 27 and 28.

"In the table 'Composition of Normal Foods' many of the analyses are based largely on the authority of Atwater and Bryant's compilation. In substituting or adding other analyses frequent reference has been made to Prof. Sherman's 'Food Products'[1] which is also largely quoted from the authority just named. Leach, 'Food Inspection and Analysis'[2] and various reports and bulletins of the Connecticut

[1] The Macmillan Company, New York, 1918.
[2] Wiley & Son, New York.

Experiment Station have also been freely consulted. Some new analyses made by this Station, not heretofore published, and unpublished analyses made for Dr. W. A. Orton in the Bureau of Chemistry of the U. S. Department of Agriculture are included.

"The general plan of arrangement of items in the table has been to present those foods which are essentially protein, fat and carbohydrate in the order named. In choosing analyses many discrepancies are found between the various authors. These are due partly to different methods of analysis and different forms of expression but more frequently no doubt, to variations in the composition of the subject material itself. In such cases the analysis which represents the average of the greatest number of individual analyses or the one which, for one reason or another, seems preferable, has been used.

"The significance of the term *protein* in this table is *nitrogen* $\times$ *6.25* except in the case of milk and milk products where the factor 6.38 is more correct and has been used. *Fat* means substances soluble in ether or 'ether extract.' It is probable that many of the figures for fat in baked products are too low. Where new analyses have been inserted fat has been determined by an improved method,[1] which gives results considerably higher. *The term 'carbohydrate' is to be accepted generally in the sense of 'nitrogen-free extract' which is the percentage obtained by deducting the sum of the percentages of water, ash, protein, fat and fiber from 100 per cent.* This proximate group includes the more readily assimilable carbohydrates, such as starch, dextrins, maltose, glucose, sucrose, invert sugar, raffinose, lactose and some other less common sugars, and also carbohydrates of doubtful or undetermined availability in human metabolism such as hemicellulose complexes, vegetable gums, mucilages, etc. A critical study of some of these less familiar carbohydrates has been made by Swartz.[2] Whenever the sense of 'carbohydrate' in the table is known to be other than that just stated the explanation is given in a footnote.

[1] Connecticut Exp. Station Bull., 1917, **200**, 133.
[2] Swartz: Tr. Connecticut Acad. Arts and Sci., 1911, **16**, 247.

"In Table 28, analyses of so-called diabetic foods, etc., are given. These are taken largely from our Bulletins 220 and 236 with the addition of new analyses made recently and not yet published and with the deletion of most of the analyses made before 1913. In many cases there are no new analyses to substitute for those thus omitted but very old analyses of commercial products of this kind serve no useful purpose. There is not the same objection to old analyses of staple articles of food.

"The general significance of the terms protein, fat and carbohydrate in this table is the same as already explained for normal foods. *Protein,* however, in those products known or declared to be made from gluten, has been estimated on the basis of the factor 5.7 and under 'Protein Preparations' protein in casein products has been estimated using the factor 6.38. The *carbohydrate* group is subdivided into two parts but it should be understood that total carbohydrate is the sum of the two. The idea of the separation is to show how much of the total carbohydrate is available, the figure in the column headed 'starch' representing this available portion so far as it has been determined or can be stated. Thus Barker's gluten Food A contains 12.4 per cent of total carbohydrate; 2.6 per cent is certainly available but the availability of the 9.8 per cent has not been determined. Wherever the figure in the starch column includes water-soluble carbohydrate, as for example, Cheltine Diabetic Food, the figure given probably represents all of the carbohydrate that is utilized in human digestion.

"Calories have been calculated on the basis of total carbohydrate in the conventional way. In the Cellu and Cellu-Bran products of the Woman's Baking Company the 'fat' is largely or entirely mineral oil and unavailable as is also probably much of the carbohydrate and therefore calories have not been calculated.

"In the 'Reference' column are given the dates of analyses. The symbols following the dates refer to analyses taken from Connecticut Experiment Station Bulletin 220."

TABLE 27.—COMPOSITION OF NORMAL FOODS.

MEAT PRODUCTS.

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Beef, fresh:				
Brisket, medium fat, edible portion	15.8	28.5	..	319
Chuck rib, edible portion, all analyses	19.0	13.4	..	197
Flank, edible portion, all analyses	19.6	21.1	..	268
Loin, edible portion, all analyses	19.0	19.1	..	247
Ribs, edible portion, all analyses	17.8	24.6	..	293
Shoulder and clod, edible portion, all analyses	20.0	10.3	..	173
Miscellaneous cuts, free from visible fat	22.4	2.9	..	116
Brain, edible portion	8.8	9.3	..	119
Heart, edible portion	16.0	20.4	..	248
Kidney, as purchased	13.7	1.9	Trace	72
Liver, as purchased	20.2	3.1	2.5[1]	119
Lungs, as purchased	16.4	3.2	..	94
Marrow, as purchased	2.2	92.8	..	844
Sweetbreads, as purchased	16.8	12.1	..	176
Suet, as purchased	4.7	81.8	..	755
Tongue, edible portion	18.9	9.2	..	158
Beef, cooked:				
Roast	22.3	28.6	..	347
Steak, round	27.6	7.7	..	180
sirloin	23.9	10.2	..	187
tenderloin	23.5	20.4	..	278
Beef, canned:				
Corned[2]	26.6	11.4	..	209
Dried and smoked[3]	32.6	7.5	..	198
Kidneys, stewed	18.4	5.1	2.1	128
Luncheon beef	27.6	15.9	..	254
Roast	25.9	14.8	..	237
Tongue, ground	21.4	25.1	..	312
whole	19.5	23.2	..	287
Tripe	16.8	8.5	..	144
Beef, corned and pickled:				
Corned beef, all analyses, edible portion	15.6	26.2	..	298
Spiced beef, rolled	12.0	51.4	..	511
Tongue, edible portion	12.8	20.5	..	236
Tripe	11.7	1.2	Trace	58

[1] Largely, or in part, glycogen.
[2] Average, 3.4 per cent salt (sodium chloride).
[3] Average, 9.7 per cent salt (sodium chloride).

MEAT PRODUCTS—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Beef, dried, salted, smoked, edible portion	30.0	6.5	..	179
Veal, fresh:				
Breast, edible portion, all analyses	20.3	11.0	..	180
Chuck, edible portion, all analyses	19.7	5.8	..	131
Flank, edible portion, all analyses	20.1	12.7	..	195
Leg, edible portion, all analyses	20.7	6.7	..	143
cutlets, edible portion	20.3	7.7	..	151
Loin, edible portion, all analyses	19.9	10.0	..	170
Heart, as purchased	16.8	9.6	..	154
Kidney, as purchased	16.9	6.4	..	125
Liver, as purchased	19.0	5.3	..	124
Lungs, as purchased	17.1	5.0	..	113
Lamb, fresh:				
Breast, edible portion	19.1	23.6	..	289
Leg, hind, medium fat, edible portion	19.2	16.5	..	225
Loin, without kidney and tallow, edible portion	18.7	28.3	..	330
Shoulder, edible portion	18.1	29.7	..	340
Lamb, cooked:				
Chops, broiled, edible portion	21.7	29.9	..	356
Leg, roast	19.7	12.7	..	193
Lamb, canned:				
Tongue, spiced, cooked, edible portion	13.9	17.8	..	216
Mutton, fresh:				
Chuck, edible portion, all analyses	14.6	36.8	..	390
Leg, hind, medium fat, edible portion	18.5	18.0	..	236
Loin, without kidney and tallow, edible portion	16.0	33.1	..	362
Shoulder, medium fat, edible portion	17.7	19.9	..	250
Heart, as purchased	16.9	12.6	..	181
Kidney, as purchased	16.5	3.2	..	95
Liver, as purchased	23.1	9.0	5.0[1]	193
Lungs, as purchased	20.2	2.8	..	106
Mutton, cooked:				
Leg roast, edible portion	25.0	22.6	..	303
Mutton, canned:				
Corned	28.8	22.8	..	320
Tongue	24.4	24.0	..	314
Pork, fresh:				
Ham, lean	25.0	14.4	..	230
Ham, medium fat, edible portion	15.3	28.9	..	321
Head cheese, edible portion	19.5	33.8	..	382
Loin (chops), lean, edible portion	20.3	19.0	..	252
Loin (chops), medium fat, edible portion	16.6	20.1	..	337
Shoulder, edible portion	13.3	34.2	..	361
Side, lard and other fat included, edible portion	9.4	61.7	..	593
Side, lard and kidneys not included, edible portion	9.1	55.3	..	534
Brains, as purchased	11.7	10.3	..	140
Heart, as purchased	17.1	6.3	..	125
Kidney, as purchased	15.5	4.8	0.7	108
Liver, as purchased	21.3	4.5	1.4[1]	131
Lungs, as purchased	11.9	4.0	..	84

[1] Largely, or in part, glycogen.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

MEAT PRODUCTS—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Pork, pickled, salted or smoked:[1]				
Ham, lean, smoked, edible portion	19.8	20.8	..	266
Ham, medium fat, smoked, edible portion	16.3	38.8	..	414
Ham, luncheon, cooked	22.5	21.0	..	279
Shoulder, medium fat, smoked, edible portion	15.9	32.5	..	356
Pig's tongue, pickled, edible portion	17.7	19.8	..	249
Pig's feet, pickled, edible portion	16.3	14.8	..	198
Salt pork, clear fat	1.9	86.2	..	783
Bacon, smoked, all analyses, edible portion	10.5	64.8	..	625
Ham, deviled	19.0	34.1	..	383
Sausage:				
Arles, edible portion	26.8	50.6	..	563
Bologna, edible portion	18.7	17.6	0.6[2]	236
Frankfort	19.6	18.6	1.1[3]	250
Pork, as purchased	13.0	44.2	1.1[4]	454
Deerfoot Farm, cooked (analysis furnished by manufacturer)	19.9	54.2	0.3	569
Pork and beef, as purchased	19.4	24.1	..	295
POULTRY.				
Poultry, fresh:				
Chicken, broilers, edible portion	21.5	2.5	..	109
liver, as purchased	22.4	4.2	2.4[5]	137
Fowls, edible portion	19.3	16.3	..	224
Goose, edible portion	16.3	36.2	..	391
Goose liver, edible portion	16.6	15.9	3.7[5]	224
Turkey, edible portion	21.1	22.9	..	291
FISH PRODUCTS.				
Fish, fresh:				
Alewife, whole, edible portion	19.4	4.9	..	122
Bass, whole, edible portion	19.0	1.4	..	89
Bluefish, edible portion	19.4	1.2	..	88
Butterfish, edible portion	18.0	11.0	..	171
Cod, edible portion	16.7	0.3	..	70
Eels, salt water, edible portion	18 6	9.1	..	156
Haddock, edible portion	17.2	0.3	..	72
Halibut, edible portion	18.6	5.2	..	121
Herring, edible portion	19.5	7.1	..	142
Mackerel, edible portion	18.7	7.1	..	139
Perch, edible portion	19.0	2.4	..	98
Porgy, edible portion	18.6	5.1	..	120
Salmon, edible portion	22.0	12.8	..	203
Shad, edible portion	18.8	9.5	..	161
Shad roe, as purchased	20.9	3.8	2.6	128
Smelt, edible portion	17.6	1.8	..	87
Trout, brook, edible portion	19.2	2.1	..	96
Trout, lake, edible portion	17.8	10.3	..	164
Whitefish, edible portion	22.9	6.5	..	150

[1] The range of salt content for cured pork products may be taken as 3 to 5 per cent.
[2] Carbohydrate range, 0.2 to 3.1 per cent.
[3] Carbohydrate range, 0.0 to 6.6 per cent.
[4] Carbohydrate range, 0.0 to 8.6 per cent.
[5] Largely, or in part, glycogen.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

FISH PRODUCTS—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Fish, preserved or canned:				
Cod, salt, "boneless," as purchased[1]	27.7	0.3	..	114
Halibut, smoked, edible portion[2]	20.7	15.0	..	218
Herring, smoked, edible portion[3]	36.9	15.8	..	290
Mackerel, salt, edible portion[4]	21.1	22.6	..	288
salt, canned, as purchased	19.6	8.7	..	157
salt, canned in oil, edible portion	25.4	14.1	..	229
Salmon, canned, edible portion	21.8	12.1	..	196
Sardines, canned, edible portion	23.0	19.7	..	269
Sturgeon, caviare, preserved, Russian, as purchased	30.0	19.7	7.6	328
Tunny (tuna), as purchased	21.7	4.1	..	124
canned in oil, edible portion	23.8	20.0	0.6	278
Shellfish, etc., fresh:				
Clams, long, in shell, edible portion	8.6	1.0	2.0[5]	51
round, in shell, edible portion	6.5	0.4	4.2[5]	46
Crabs, hard shell, whole, edible portion	16.6	2.0	1.2[5]	89
Crayfish, edible portion	16.0	0.5	1.0[5]	73
Lobster, edible portion	16.4	1.8	0.4[5]	83
Mussels, in shell, edible portion	8.7	1.1	4.1[5]	61
Oysters, in shell, edible portion	6.2	1.2	3.7[5]	50
Scallops, as purchased	14.8	0.1	3.4[5]	74
Terrapin, edible portion	21.2	3.5	..	116
Turtle, green, edible portion	19.8	0.5	..	84
Shellfish, etc., canned:				
Clams, round, as purchased	8.3	0.4	2.7[5]	48
long, as purchased	8.9	0.8	0.9[5]	46
Crabs, as purchased	15.8	1.5	0.7[5]	80
Lobster, as purchased	18.1	1.1	0.5[5]	84
Oysters, as purchased	8.8	2.4	3.9[5]	72
Shrimp, as purchased	25.4	1.0	0.2	111
AMPHIBIA.				
Frog's legs, edible portion	15.5	0.2	..	64
GELATIN.				
Gelatin	84.2[6]	0.1	None	338
EGGS.				
Eggs, fresh:[7]				
Hen, whole egg, edible portion	13.4	10.5	..	148
white	12.3	0.2	..	51
yolk	15.7	33.3	..	363

[1] Contains 14.7 per cent ash, largely salt.
[2] Contains 15.0 per cent ash, largely (12.1 per cent) salt.
[3] Contains 13.2 per cent ash, largely (11.7 per cent) salt.
[4] Contains 13.2 per cent ash, largely (9.2 per cent) salt.
[5] Largely, or in part, glycogen.
[6] Nitrogen × 5.55.
[7] In shell eggs the shell comprises from 10 to 17 per cent of the weight of the whole egg; water content ranges from 60 to 67 per cent. Sea-turtle eggs contain about 76 per cent water.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

EGGS—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Eggs, fresh:				
Duck, whole egg, edible portion	13.3	14.5	..	184
white	11.1	Trace	..	44
yolk	16.8	36.2	..	393
Goose, whole egg, edible portion	13.8	14.4	..	185
white	11.6	Trace	..	46
yolk	17.3	36.2	..	395
Turkey, whole egg, edible portion	13.4	11.2	..	154
white	11.5	Trace	..	46
yolk	17.4	32.9	..	366
Guinea fowl, whole egg, edible portion	13.5	12.0	..	162
white	11.6	Trace	..	46
yolk	16.7	31.8	..	353
Plover, whole egg, edible portion	10.7	11.7	..	148
Turtle, fresh water	18.1	11.1	..	172
sea	18.8	9.8	..	163
Eggs, edible portion, cooked:				
Hen, boiled	13.2	12.0	..	161
whites	12.3	0.2	..	51
yolks	15.7	33.3	..	363
Eggs, dehydrated, average	40.6	43.7	..	556

DAIRY PRODUCTS, ETC.

Milk:				
Milk, whole	3.3	4.0	4.8	68
condensed (evaporated, concentrated)	6.9	8.2	9.9	141
sweetened, condensed (sweetened evaporated, sweetened concentrated)	7.9	9.0	54.6[1]	331
skimmed	3.4	0.3	5.1	37
sweetened, condensed	9.1	1.0	59.1[2]	282
Buttermilk	3.6	0.5	4.1	35
Kephir	3.1	2.0	1.6	37
Kumiss[3]	2.8	2.0	5.4	51
Cream, "heavy" (approximately 40 per cent)	2.1	41.0	1.5	383
"light" (approximately 20 per cent)	2.8	22.0	2.7	220
heavy, sour	4.1	41.6	1.5	397
Whey	1.0	0.3	5.0	27
Milk powder (dried milk):				
From whole milk	25.3	25.3	37.5	479
From partly skimmed milk (mammala type)	25.8	14.5	49.9	433
From skimmed milk, average	34.6	1.9	50.9	359
Malted milk (milk powder with malted cereal) average	13.8	6.8	71.9	404

[1] Cane sugar, 40.6 per cent; milk sugar, 14 per cent.

[2] Cane sugar, 40.9 per cent; milk sugar, 18.2 per cent.

[3] According to Van Slyke (Leach: Food Inspection and Analysis, p 174), Kumiss, from cows' milk, contains lactose, 5 per cent; protein, 4.1 per cent; fat (calculated), 1.2 per cent.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

DAIRY PRODUCTS, ETC.—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Cheese:				
American, pale	28.8	35.9	0.3	440
red	29.6	38.3	..	463
Camembert	21.0	21.7	..	279
Cheddar	26.4	32.7	3.0	412
Cheshire	32.5	26.1	4.5	383
Cottage	20.9	1.0	4.3	110
Cottage, Jewish	27.9	9.2	None	194
Dutch	37.1	17.7	..	308
Edam	24.1	30.3	4.6	388
Full cream	25.4	30.3	2.0	382
Limburger	23.0	29.4	0.4	358
Neufchatel	18.7	27.4	1.5	327
Pineapple	29.9	38.9	2.6	480
Roquefort	22.6	29.5	1.8	363
Skimmed milk	31.5	16.4	2.2	282
Swiss	27.6	34.9	1.3	430
Ice cream, typical	3.8	12.6[1]	19.6	207

FATS AND OILS.

Fats and Oils:				
Butter,[2] average	1.5	84.6	None	767
Oleomargarine,[3] average	0.8	92.4	None	835
Nut margarine,[4] average	1.4	84.8	None	769
Salad oils and cooking fat, typical	Trace	99.7	None	897

SOUPS AND BROTHS.

Soups, home-made:				
Bean	3.2	1.4	9.4	63
Beef	4.4	0.4	1.1	26
Chicken	10.5	0.8	2.4	59
Clam chowder	1.8	0.8	6.7	41
Meat stew	4.6	4.3	5.5	79
Soups, broths, etc., canned:				
Asparagus, cream of	2.5	3.2	5.5	61
Bouillon, beef	2.2	0.1	0.2	11
clam, typical	1.0	0.1	0.6	7
Celery, cream of	2.1	2.8	5.0	54
Chicken gumbo	3.8	0.9	4.7	42
soup	3.6	0.1	1.5	21
Consommé	1.4	0.1	0.4	8
Corn, cream of	2.5	1.9	7.8	58
Julienne	2.7	..	0.5	13
Mock turtle	3.0	1.0	5.7	44
Mulligatawny	3.7	0.1	5.7	39
Oxtail, edible portion	3.7	1.3	7.1	55
Pea soup	3.6	0.7	7.6	51
Pea, cream of green	2.6	2.7	5.7	58
Tomato soup	1.8	1.1	5.6	40
Turtle, green	6.1	1.9	3.9	57
Vegetable	2.9	..	0.5	14

[1] Standards for fat in different States vary from 7 to 14 per cent.

[2] Average salt content, 1.6 per cent; range, 0.2 to 4.1 per cent.

[3] Average ash content (largely salt), 0.9 per cent; range, 0.4 to 3.1 per cent.

[4] Average ash content (largely salt), 2.9 per cent; range, 1.1 to 6.1 per cent.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

SOUPS AND BROTHS—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories per 100 gms.
Bouillon cubes:				
As purchased, average analysis[1]	11.4	1.8	5.8	85
Prepared as directed, average analysis[2]	0.2	Trace	0.1	1
Clam extract:				
As purchased	23.2	0.2	11.8	142
Prepared as directed[3]	0.5	Trace	0.3	3
Yeast extract, as purchased	31.3	0.2	12.5	177

CEREAL PRODUCTS, ETC.

Alimentary pastes:				
Macaroni	13.4	0.9	74.1	358
cooked	3.0	1.5	15.8	91
Noodles	11.7	1.0	75.2	357
Spaghetti	12.1	0.4	75.9	356
Vermicelli	10.9	2.0	72.0	350
Bread, soft:				
Bread, alfalfa	10.6	1.3	64.0	310
corn (Johnnycake)	7.9	4.7	46.3[4]	259
Graham	8.9	1.8	51.0	256
peanut	33.6	12.8	20.0	330
rye	9.0	0.6	52.7	252
rye, Jewish	9.1	1.1	52.0	254
whole rye	11.9	0.6	35.0	193
rye and wheat	11.9	0.3	51.5[4]	256
wheat, average of many analyses	9.2	1.3	52.6	259
wheat, whole	9.7	0.9	48.5	241
Bread, hard, and crackers:				
Bread, white, toasted	11.5	1.6	61.2	305
Zwieback	9.8	9.9	73.5[4]	422
Crackers, Boston (split)	11.0	8.5	70.3	402
butter	9.6	10.1	71.2	414
cream	9.7	12.1	69.1	424
egg	12.6	14.0	66.2	441
flatbread	14.9	0.5	73.6[4]	359
Graham	10.0	9.4	72.3	414
oatmeal	11.8	11.1	67.1	416
oyster	11.3	10.5	70.3	421
pilot	11.1	5.0	73.9	385
pretzels	9.7	3.9	72.3	363
saltines	10.6	12.7	68.0	429
soda	9.8	9.1	72.8	412
water	11.7	5.0	75.3	393
Pastry, etc.:				
Cake, coffee	7.1	7.5	62.8	347
cup	5.9	9.0	68.2	377
frosted	5.9	9.0	64.8[4]	364
fruit	5.9	10.9	64.1	378
gingerbread	5.8	9.0	62.4	354
sponge	6.3	10.7	65.9[4]	385
Cookies	7.0	9.7	73.2	408
Doughnuts	6.7	21.0	52.4	425
Fig bars	4.6	6.6	68.1	350
Ginger snaps	6.5	8.6	75.3	405
Lady fingers	8.8	5.0	70.4	362
Macaroons	6.5	15.2	64.1	419

[1] Average salt content, 70.2 per cent.

[2] Average cube weighs 3.8 gms.; 1 cup of broth is assumed to weigh 240 gms.; salt content of prepared broth, 1.1 per cent.

[3] Salt content, 0.4 per cent.

[4] Includes fiber.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

CEREAL PRODUCTS, ETC.—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Pastry, etc.—Continued:				
Pie, apple	3.1	9.8	42.8[1]	272
cream	4.4	11.4	51.2[1]	325
custard	4.2	6.3	26.1[1]	178
lemon	3.6	10.1	37.4[1]	255
mince	5.8	12.3	38.1[1]	286
raisin	3.0	11.3	47.2[1]	303
squash	4.4	8.4	21.7[1]	180
Pudding, Indian meal	5.5	4.8	27.5[1]	175
rice custard	4.0	4.6	31.4[1]	183
tapioca	3.3	3.2	28.2[1]	155
Wafers, miscellaneous	8.7	8.6	74.1	409
vanilla	6.6	14.0	71.3	438
Breakfast foods:				
Barley preparations:				
barley crystals	11.5	1.3	75.2	359
cream of barley	11.1	1.6	76.2	364
pearled barley	9.5	0.9	76.2	351
Corn (maize) preparations:				
Ceraline, corn meal, hominy, average of 9 brands	8.9	1.2	76.4	352
flakes, crisps, puffs, etc., average of 8 brands	7.4	0.3	79.2	349
hominy, cooked (79 per cent water)	2.2	0.2	17.8	82
pop corn	10.7	5.0	77.3	397
Oat preparations:				
oatmeal, groats, etc., average of 5 analyses	14.6	7.7	65.1	388
rolled oats, crushed oats, oat flakes, average of 12 analyses	15.4	6.8	64.1	379
oatmeal, boiled (85 per cent water)	2.8	0.5	11.5[1]	62
oatmeal, gruel (92 per cent water)	1.2	0.4	6.3[1]	34
oatmeal water (96 per cent water)	0.7	0.1	2.9	15
Rice preparations:				
rice flakes, puffs, etc., average of 7 analyses	8.2	0.2	79.8	354
rice, boiled (73 per cent water)	2.8	0.1	24.4	110
Rye preparations:				
cream of rye	12.0	1.6	71.9	350
rye flakes	11.4	1.5	76.2	364
Wheat preparations:				
cracked and crushed	11.1	1.7	73.8	355
Farina	11.0	1.4	75.9	360
flakes	13.4	1.4	72.5	356
parched or toasted	13.6	2.4	73.7	371
Shredded	10.5	1.4	76.2	359
Flours, meals, etc.:				
Barley flour	12.3	2.4	71.3	356
Buckwheat flour	6.4	1.2	77.5	346
Corn flour	8.5	2.1	76.0	357
Corn meal	9.2	1.9	74.4	352
Oat flour	15.1	6.4	65.7	381
Potato flour	0.5	0.3	83.0	337
Rice flour	7.3	0.6	79.3	352
Rye flour	6.8	0.9	78.3	349

[1] Includes fiber.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

CEREAL PRODUCTS, ETC.—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Flours, meals, etc.:				
Rye meal	13.6	2.0	69.7	351
Soy-bean flour	42.5	19.9	24.3	446
Wheat flour, entire	13.8	1.9	71.0	356
Wheat flour, Graham	13.3	2.2	69.5	351
Wheat flour, patent, average	11.4	1.0	74.8	354
VEGETABLES.				
Vegetables, fresh (unless otherwise stated):				
Aralia Cordata (Udo)	1.0	0.2	2.6	16
Artichokes	2.6	0.2	15.9[1]	76
Jerusalem	2.9	0.1	16.4[1]	78
cooked	2.4	0.1	16.5[1]	77
Asparagus	1.8	0.2	2.4	19
Basella	2.5	0.5	1.7	21
Beans, butter	9.4	0.6	29.1[2]	159
cranberry, young pods	0.4	None	0.6	4
medium	1.3	0.6	1.7	17
fancy	1.0	0.1	2.1	13
Lima	7.1	0.7	20.3	116
refugee, young pods	0.5	None	0.8	5
medium	1.3	0.1	3.0	18
fancy	1.1	0.1	1.4	11
string (carbohydrate range, 3.9 to 10 per cent)	2.3	0.3	5.5	34
string, cooked	0.8	1.1	1.9	21
Beets (carbohydrate range, 6 to 10 per cent)	1.6	0.1	8.8	43
cooked	2.3	0.1	7.4	40
Borage (salad plant)	3.0	0.4	0.4	17
Brussels sprouts	1.5	0.1	3.4	21
Burdock	4.5	0.1	7.4	49
Cabbage (carbohydrate range, 3–6.5 per cent)	1.6	0.3	4.5	27
Chinese	1.2	0.1	2.4	15
Carrots (carbohydrate range, 5.9–11.5 per cent)	1.1	0.4	8.2	41
Cassava, root	1.6	0.2	27.1	117
Cauliflower	1.8	0.5	3.7	27
Celeriac	1.8	0.2	6.0	33
Celery	1.1	0.1	3.3[2]	19
root	2.0	0.4	6.3	37
Chard (Swiss)	3.2	0.6	5.0[2]	38
Chayote (tayote)	0.9	0.1	5.9	28
Chenopodium	8.5	1.1	2.7	55
Chicory, root	..	..	15.0	..
leaves, Italian	1.9	0.4	0.8	14
Chinese vegetables:				
Kai Tsoi	1.7	0.2	1.8	16
Bak Toy	1.2	0.1	1.1	10
Collards	3.2	0.6	2.3[3]	49
Corn	3.1	1.1	19.2	99
Cucumbers	0.8	0.2	2.3	14
Egg plant	1.2	0.3	4.3	25
Endive	1.0	None	2.6	14
Finocchio	1.5	0.1	1.6	13
Greens, beet, cooked	2.2	3.4	3.2[2]	52
dandelion, as purchased	2.7	0.8	6.3	43
turnip salad	4.2	0.6	6.3[2]	47

[1] Chiefly inulin. [2] Includes fiber.

[3] Starch and sugar.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

VEGETABLES—*Continued.*

Name and description of food	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Vegetables, fresh (unless otherwise stated):				
Kale	3.0	0.4	2.1	24
sea	1.4	None	3.8	21
Kohl-rabi (carbohydrate range, 3.5–14 per cent)	2.0	0.1	4.2	26
Lambs' quarters	3.8	0.6	1.7	27
Leeks	2.9	0.1	4.0[1]	29
Lettuce	1.2	0.3	2.2	16
Mushrooms[2]	3.5	0.4	6.0	42
Mustard	2.4	0.3	0.3[1]	14
Okra	1.6	0.2	4.0	24
Onions (carbohydrate range, 4–14 per cent)	1.6	0.3	9.0	45
cooked	1.2	1.8	4.9	41
Orach	4.6	0.4	0.2[1]	23
Oyster plant	1.2	0.1	7.0	34
Palmetto cabbage	3.3	0.6	6.1	43
cooked	2.9	0.5	5.6	39
Parsnips (carbohydrate range, 6–14 per cent)	1.6	0.5	11.0	55
Patience (Rumex Patientia)	2.1	0.2	0.1[1]	11
Peas,[3] green, cooked	6.7	3.4	14.6[4]	116
marrowfat, first grade	5.1	..	12.4	..
second grade	6.7	..	11.0	..
third grade	5.9	..	14.5	..
petits pois, first grade	3.4	..	7.0	..
second grade	4.2	..	10.4	..
third grade	4.4	..	10.3	..
sifted, first grade	5.3	..	12.2	..
second grade	5.7	..	13.1	..
third grade	5.6	..	15.5	..
Peppers, Neapolitan	1.1	0.3	5.7	30
sweet, green	0.8	0.1	4.1	21
Potatoes	2.2	0.1	18.0	82
air (tropical Asia)	1.9	0.4	16.3	76
boiled	2.5	0.1	20.3	92
cooked, chips	6.8	39.8	46.7[4]	572
mashed and creamed	2.6	3.0	17.8[4]	109
sweet (carbohydrate range, 16.5–44.5 per cent)	1.8	0.7	26.1	118
cooked	3.0	2.1	42.1[4]	199
Pumpkins (carbohydrate range, 3–14 per cent)	1.0	0.1	6.0	29
Radishes (carbohydrate range, 2.7–7.5 per cent)	1.3	0.1	5.1	27
Rhubarb	0.6	0.7	2.5	19
Roquette (Rocket salad)	0.7	0.4	0.3[1]	8
Rutabagas (carbohydrate range, 3–12 per cent)	1.3	0.2	7.3	36
Sauerkraut	1.7	0.5	3.0	23
Sorrel	2.1	0.2	0.1[1]	11
Spinach	2.1	0.3	2.3	20
cooked	2.1	4.1	2.6[4]	56
Squash	1.4	0.5	8.2	43
Tomatoes	0.9	0.4	3.3	20
Truffles	9.1	0.5	7.0	69

[1] Starch and sugar.
[2] Protein and carbohydrates largely unassimilable (E. P. J.).
[3] Fat content may be taken to range from 0.5 to 1 per cent.
[4] Includes fiber.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

VEGETABLES—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Vegetables, fresh (unless otherwise stated):				
Turnips (carbohydrate range, 2.3–18 per cent)	1.3	0.2	6.8	34
Vegetable marrow	0.7	0.1	1.5	10
Italian	0.7	0.1	1.4	9
Watercress	0.7	0.5	3.7	22
Yams	1.6	0.2	23.6	103
Yautia (Tanier)	4.2	0.4	53.0	232
Vegetables, dried:				
Beans	22.5	1.8	55.0	326
frijoles	21.9	1.3	65.1[1]	360
Lima	18.1	1.5	65.9[1]	350
mesquite	12.2	2.5	77.1[1]	380
soy	38.3	14.9	26.6[2]	394
Carrots, evaporated	7.7	3.6	80.3[1]	384
Lentils	25.7	1.0	59.2[1]	349
Peas	24.6	1.0	57.5	337
cow	21.4	1.4	56.7	325
Peppers, green	15.5	8.5	63.0[1]	391
red	9.4	7.7	70.0[1]	387
Potatoes, evaporated	8.5	0.4	80.9[1]	361
Tomatoes	12.9	8.1	62.3[1]	374
Vegetables, canned:				
Artichokes (carbohydrate range, 3.2–6.1 per cent)	0.8	..	4.4	21
Asparagus (carbohydrate range, 1.6–3.3 per cent)	1.5	0.1	2.3	16
Beans, baked	6.9	2.5	17.1	119
haricots verts	1.1	0.1	2.0	13
flageolets (carbohydrate range, 9.8–12.4 per cent)	4.6	0.1	11.5	65
Lima (carbohydrate range, 9.6–16.5 per cent)	4.0	3.0	13.4	97
little green	1.2	0.1	2.8	17
red kidney	7.0	0.2	17.3	99
string (carbohydrate range, 1.5–4.5 per cent)	1.1	0.1	3.3	19
wax	1.0	0.1	2.5	15
Brussels sprouts	1.5	0.1	2.9	19
Corn[3] (carbohydrate range, 11.7–25.1 per cent)	2.8	1.2	18.2	95
and tomatoes	1.6	0.4	9.1	46
Macedoine (mixed vegetables)	1.4	..	3.9	21
Okra[4]	0.7	0.1	2.9	15
Peas[5] (carbohydrate range, 4.3–17.2 per cent)	3.6	0.2	8.6	51
Potatoes, sweet	1.9	0.4	40.6	174
Pumpkins (carbohydrate range, 3.6–7.3 per cent)	0.8	0.2	5.6	27
Squash (carbohydrate range, 3.6–12.8 per cent)	0.9	0.5	9.8	47
Succotash (carbohydrate range, 13.9–21.3 per cent)	3.6	1.0	17.7	94
Tomatoes (carbohydrate range, 1–4.5 per cent)	1.2	0.2	3.5	21

[1] Includes fiber.

[2] About one-fourth available.

[3] Average, 0.4 per cent salt (NaCl).

[4] Average, 1.1 per cent salt (NaCl).

[5] Average, 0.7 per cent salt (NaCl).

PICKLES, CONDIMENTS, ETC.

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories per 100 gms.
Pickles, condiments, etc.:				
Capers	3.2	0.5	5.0	37
Catsup, tomato (carbohydrate range, 3–26 per cent)	1.8	0.2	10.0	49
Chili sauce (carbohydrate range, 14–28 per cent)	..	..	20.0	..
Horseradish	1.4	0.2	11.0	51
Olives, green, edible portion	2.1	12.9	1.8	132
ripe, edible portion	1.7	25.9	4.3[1]	257
Mustard, prepared	4.7	4.1	5.0	76
cereal added (carbohydrate range, 4–15 per cent)	3.5	1.9	7.0	59
Pickles, cucumber	0.5	0.3	2.7	16
mixed	1.1	0.4	4.0	24
spiced	0.4	0.1	21.0	87
Vinegar, cider (carbohydrate range, 0.3–1.5 per cent)	None	None	0.3	1
distilled	None	None	None	..
malt	..	..	0.5[2]	..
spiced salad	..	..	10.0	..
Tarragon	..	..	0.2[2]	..
wine	..	..	0.4	..

FRUITS, BERRIES, ETC.
(*Analyses are of edible portion.*)

Fruits, berries, etc., fresh:				
Apples (carbohydrate range, 9–21 per cent)	0.4	0.5	13.0	58
Apricots	1.1	..	12.0	..
Avocados (alligator pears)	1.1	13.7	7.1	156
Bananas	1.3	0.2	20.0	88
Blackberries	1.3	1.0	8.4	48
Cherries	1.0	0.8	16.5	77
Citrang juice	1.3	..	6.9	..
Cranberries	0.4	0.6	8.4	41
Currants	1.5	..	12.8[1]	..
Egg fruit	3.4	1.9	41.0	195
Figs	1.5	..	18.8[1]	..
Gooseberries	0.4	..	12.0	..
Grapes	1.3	1.6	14.9	79
Grapejuice (carbohydrate range, 11–20 per cent)	..	..	15.0	..
Grapefruit[3]	..	..	7.2	..
Huckleberries	0.6	0.6	16.6[1]	74
Lemons	1.0	0.7	7.4	40
juice	..	..	9.8	..
Loganberries[4]	4.6	0.6	7.2[5]	53
juice[6]	0.6	..	6.8[5]	..

[1] Includes fiber.
[2] Manufacturers' analysis.
[3] Florida, California and Porto Rico, carbohydrate range, 6.6–8.2 per cent (E. M. Frankel).
[4] Jour. Ind. and Eng. Chem., 1918, **10**, 30.
[5] Invert sugar.
[6] Jour. Ind. and Eng. Chem., 1917, **9**, 1043.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Continued.*)

FRUITS, BERRIES, ETC.—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Fruits, berries, etc., fresh:				
Loquat	0.3	..	23.0	..
Mangoes	..	..	13.0	..
Mulberries	0.3	..	12.0	..
Muskmelons	0.7	0.3	10.0	46
Nectarines	0.6	..	15.9[1]	..
Oranges[2]	0.8	0.2	11.6[1]	51
Orange-lemon juice	0.6	..	1.8	..
Papaya (papaw)	0.8	0.1	6.3	29
Peaches	0.5	0.2	9.0	40
Pears	0.6	0.5	11.4	53
Persimmons	0.8	0.7	29.7	128
Pineapple	0.4	0.3	12.0	52
Plums	1.0	..	17.0	..
Pomegranates	1.5	1.6	17.0	88
Prunes	0.8	..	19.0	..
Quince	0.3	0.1	13.2	55
Raspberries, black	1.7	1.0	10.0	56
red	1.0	..	9.7	..
Sapodilla	0.6	1.4	19.4	93
Sour sop	0.8	0.1	17.2	73
Strawberries	1.0	0.6	6.0	33
Tangelo juice	0.7	..	9.0	..
Watermelons	0.3	0.1	7.0	30
Whortleberries	0.7	0.3	10.0	46
Fruits, berries, etc., dried:				
Apples	1.6	2.2	66.1[1]	291
Apricots	4.7	1.0	62.5[1]	278
Citron	1.5	1.5	78.1[1]	332
Currants	2.4	1.7	74.2[1]	322
Dates	2.1	2.8	78 4[1]	347
Figs	4.3	0.3	74.2[1]	317
Prunes	2.1	..	73.3[1]	..
Raisins	2.6	3.3	76.1[1]	345
Raspberries	7.3	1.8	80.2[1]	366
Fruits, berries, etc., canned; jellies and preserves:[3]				
Apricots	0.9	..	17.3[1]	..
Apricot sauce	1.9	1.3	48.8[1]	215
Blackberries	0.8	2.1	56.4[1]	248
Blueberries	0.6	0.6	12.8[1]	59
Cherries	1.1	0.1	21.1[1]	90
Cherry jelly	1.1	..	77.2[1]	..
Figs, stewed	1.2	0.3	40.9[1]	171
Grape butter	1.2	0.1	58.5[1]	240
Grapefruit	0.5	0.1	8.3	36
Marmalade, orange	0.6	0.1	84.5[1]	341
Peaches	0.7	0.1	10.8[1]	47
Pears	0.3	0.3	18.0[1]	76
Pineapple	0.4	0.7	36.4[1]	154
Prune sauce	0.5	0.1	22.3[1]	92
Strawberries, stewed	0.7	..	24.0[1]	..
Tomato preserves	0.7	0.1	57.6[1]	234

[1] Includes fiber.

[2] Florida, average of seven analyses, carbohydrate, 8 per cent; California, eight analyses, carbohydrate, 8.3 per cent (E. M. Frankel).

[3] Jams, jellies, preserves and marmalade contain 47 per cent or more carbohydrate. There is a wide variation in the sugar content of canned fruits. Pie peaches are packed in water while other grades may be found in 30, 40 or even 50 per cent syrup.

TABLE 27.—COMPOSITION OF NORMAL FOODS.—(*Concluded.*)

NUTS.

(*Analyses are of edible portion.*)

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Nuts:				
Almond	21.0	54.9	15.3	639
Almond butter	22.1	61.5	7.9	674
Beechnuts	21.9	57.4	13.2[1]	657
Brazil nuts	17.0	66.8	7.0[1]	697
Butternuts	27.9	61.2	3.5[1]	676
Cashew nuts	9.7	47.2	17.0	532
Chestnuts	6.2	5.4	40.3	235
Cocoanuts	5.7	50.6	27.9[1]	590
Cocoanut milk	0.4	1.5	4.6	34
prepared	6.3	57.4	31.5[1]	668
Filberts	15.6	65.3	13.0[1]	702
Hickory nuts	15.4	67.4	11.4[1]	714
Lichi nuts	2.9	0.2	77.5[1]	323
Peanuts	25.8	38.6	21.9[1]	538
Peanut butter	29.3	46.5	17.1[1]	604
Pecans	9.6	70.5	15.3[1]	734
Pine nuts, Pignolias	33.9	49.4	6.9[1]	608
Piniones	6.5	60.7	26.2[1]	677
Pinon	14.6	61.9	17.3[1]	685
Sabine	28.1	53.7	8.4[1]	629
Pistachios	22.3	54.0	16.3[1]	640
Walnuts, California	18.4	64.4	11.6[1]	700
black	27.6	56.3	10.0	657
soft shell	16.6	63.4	13.5	691
ALCOHOLIC BEVERAGES.				
Distilled liquors[2] (whisky, gin, rum, brandy)	..	..	None or trace	..
Wines,[3] dry (carbohydrate range, trace to 3.6 per cent)	..	..	0.3	..
sweet (carbohydrate range 0.1–40.7 per cent)	..	..	8.0	..
Cordials[4] (creme de menthe, kümmel, benedictine, anisette, chartreuse	..	..	30.0	..
Beer,[5] near (average of several brands)	..	..	5.0	..
Ale[6]	..	..	5.1	..
Malt extract, commercial	..	..	10.6	..
true, concentrated	..	..	71.3	..
Cider[7] (carbohydrate range, 0–13.5 per cent)	..	..	4.5	..
OTHER BEVERAGES.				
Tea (0.5 oz. to 1 pt. water)	..	..	0.6	..
Coffee (1 oz. to 1 pt. water)	..	..	0.7	..
Cocoa (0.5 oz. to 1 pt. water)	..	..	1.1	..
(0.5 oz. to 1 pt. milk)	..	..	6.0	..
Carbonated drinks (bottled soda, sarsaparilla, birch beer, root beer, gingerale)	..	..	8.0	..

[1] Includes fiber.

[2] Sugar is sometimes added to brandy. One sample examined was sensibly sweet and contained 33.5 per cent of sugar (Connecticut Exp. Sta. Bull. 227, 1920, p. 232). Range of alcohol content, 35 to 50 per cent.

[3] Natural wines contain 6 to 12 per cent alcohol; "fortified" wines, 15 to 20 per cent.

[4] Range of alcohol content, 35 to 50 per cent.

[5] Range of alcohol content for beer, generally 3 to 5 per cent; for prohibition beer (near beer), not over 0.5 per cent.

[6] Range of alcohol content, same as for beer.

[7] Range of alcohol content, generally 2.5 to 6 per cent.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	FLOURS AND MEALS.					
	Herman Barker, Somerville, Mass.:					
1919	Barker's Gluten Food "A"	77.0	0.4	2.6	9.8	361
1919	Barker's Gluten Food "B"	74.0	0.5	5.2	10.1	362
1919	Barker's Gluten Food "C"	73.0	0.4	6.4	9.8	360
	Battle Creek Sanitarium Co., Battle Creek, Mich.:					
1916–4*a*	Gluten Meal	26.3	1.0	55.0	8.7	369
1919–4*a*	Gluten Meal	39.3	0.9	41.1	10.1	370
1914–2*q*	Gluten Meal, 80 per cent	76.6	..	5.8	..	..
	Callard, Stewart & Watt, London:					
1909–3	Casoid Flour	82.5	1.6	None	3.1[1]	357
1916–4*a*	Gluten Flour	73.4	..	None	..	..
	Canada Cereal & Flour Co.:					
1919–4*b*	Gluten Flour	18.6	4.5	43.9	16.9	358
	Cereal Meal Corporation, St. Louis, Mo.:					
1923	Cereal Meal	19.2	6.6	34.8	23.4	369
	Cereo Co., Tappan, N. Y.:					
1919	Soy Bean Gruel Flour	46.1	18.6	0.9	21.9	443
	Cheltine Food Co., Cheltenham, Eng.:					
1922	Cheltine Diabetic Food	57.9	10.1	16.4[2]	3.3	401
	The Dieto Food Co., New York:					
1914–2*q*	Pure Whole Wheat Flour	13.5	2.1	62.4	12.0	371
	Empire Flour Mills:					
1919–4*b*	Gluten Flour	13.1	1.1	59.1	15.5	361
	Farwell & Rhines, Watertown, N. Y.:					
1913–2*p*	Cresco Flour	18.1	1.0	57.2	10.2	351
1923	Gluten Flour	40.5	1.4	43.2[2]	5.1	368
1913–2*p*	Special Diabetic Food	27.5	2.8	40.0	16.6	362
	Federal Mill & Elevator Co., Lockport, N. Y.:					
1922	Gluten Flour	38.5	1.8	42.3[2]	6.9	367
	Gericke, Potsdam:					
1910–9	Aleuronat	76.0	3.3	..	10.5[1]	376
	Golden Rod Milling Co., Portland, Ore.:					
1919	Acme Special Flour	15.1	1.8	61.5	8.6	357
1916–4*a*	Gluten Flour	14.1	1.3	67.0	..	..
	O. B. Gilman, Boston, Mass.:					
1913–2*p*	Gluten Flour	43.2	2.0	31.4	13.1	369
	The Health Food Co., New York:					
1919	Almond Meal	50.3	15.4	None	18.0	412
1919	Bran Biskue, Gluten Bran	27.7	10.5	33.8	13.9	396
1919	Diabetic Casein Flour (self-raising)	72.3	0.8	None	5.7	319
1919–4*b*	Gluten Flour, 40 per cent	39.2	1.1	37.3	13.0	368
1919	Glutosac Gluten Flour	41.5	1.7	36.2	9.1	363
1919	Pronireu (Gluten Griddle Cake Flour)	37.9	1.2	36.6	9.1	345
1914–2*q*	Protosac Gluten Flour	41.9	2.0	31.5	14.8	371
1919	Protosoy Soy Flour	39.4	18.6	1.9	25.1	433

[1] Includes fiber.
[2] Includes soluble carbohydrate.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	FLOURS AND MEALS—*Continued.*					
1919	Pure Washed Gluten Flour	74.9	2.0	3.8	10.0	373
1919	Snow Flake Diabetic Casein Flour	79.2	1.2	None	3.2	340
	Hudon Hebert (Furn'r.):					
1919–4*b*	Gluten Flour	14.4	2.2	52.5	16.8	355
	Jireh Diabetic Food Co., New York:					
1919–4*b*	Diabetic Flour	14.8	2.0	50.1	20.7	360
1919–4*b*	Gluten Flour	14.4	2.1	50.0	21.9	364
1913–2*p*	Patent Barley	11.4	1.6	67.8	12.4	381
1913–2*p*	Patent Cotton Seed Flour	49.1	12.7	6.0	15.3	396
1913–2*p*	Patent Lentils Flour	27.3	1.2	42.6	17.2	359
1913–2*p*	Protein Flour	31.4	2.0	48.5	8.2	370
1913–2*p*	Soja Bean Flour	42.3	18.2	None	25.8	436
1906–2*e*	Wheat and Barley Flour	11.8	1.9	66.2[1]	7.3	358
	Johnson Educator Food Co., Boston, Mass.:					
1911 2*k*	Educator Standard Gluten Flour	36.6	1.4	40.9	12.8	374
	The Kellogg Food Co., Battle Creek, Mich.:					
1916–2*s*	Gluten Meal, 20 per cent	24.7	0.9	51.2	14.2	369
1919	Gluten Flour, 40 per cent	47.2	1.0	30.7	10.2	361
1919	Gluten Meal, thoroughly cooked, 40 per cent	43.0	1.5	33.4	12.0	367
1912–2*m*	Gluten, 80 per cent	74.2	0.9	6.2	8.8	365
1919	Pure Gluten Meal	79.1	0.7	2.6	8.7	368
	La Societe l'Aliment "Essentiel," Nanterre, France:					
1921	Heudebert, Surazotized Gluten Flour	61.3	2.3	14.0[1]	10.9	366
1921	Heudebert, Gluten Flour with Cacao	53.6	5.8	13.8[1]	14.7	381
	Lister Bros., New York:					
1919	Lister's Diabetic Flour, self-rising	68.3	1.0	None	9.7	321
	Lyster Bros., Whitefield, N. H.:					
1915–2*r*	Casein Flour	84.5	3.6	None	0.4	372
1916–12*a*	Diabetic Flour	79.3	3.0	None	..	..
	Loeb's Diabetic Food Bakery, N. Y.:					
1919	Gluten Cracker Meal	36.7	10.9	30.7	11.5	414
1923	Pure Gluten Flour	41.5	2.2	39.7[1]	7.4	374
1923	Special Gluten	73.2	2.0	9.4	8.7	383
	Maple Leaf Milling Co.:					
1919–4*b*	Gluten Flour	12.7	1.2	61.5	11.5	354
	Thos. Martindale & Co., Phila., Pa.:					
1919	Special Gluten Flour	36.8	1.5	41.4	11.2	371
	Mayflower Mills, Fort Wayne, Ind.:					
1919	Gluten Flour	48.0	1.7	28.6	10.2	363
	A. McFarlane Co.:					
1919–4*b*	Gluten Flour	12.1	1.4	60.3	14.3	359
	P. McIntosh Co.:					
1919–4*b*	Gluten Flour	15.1	1.0	63.3	9.3	360

[1] Includes soluble carbohydrate.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent	Other carbohydrate, per cent.	
	FLOURS AND MEALS—*Continued.*					
	Theo. Metcalf Co., Boston, Mass.:					
1913–2*p*	Soja Bean Meal, 18 per cent starch	41.0	20.0	25.0		444
1913–2*p*	Vegetable Gluten, 8.1 per cent starch	73.3	1.5	5.9	11.0	374
	Northwestern Cereal Co., London, Ont.:					
1919–4*b*	Gluten Flour	17.1	5.0	42.1	22.0	370
1919–4*b*	Gluten Flour, 40 per cent	14.2	5.3	38.7	25.6	361
	Phospho Food Co., Los Angeles, Calif.:					
1914–2*q*	Phospho D & D Special	13.7	2.2	58.6	14.4	367
	Plasmon Co., London, Eng.:					
1922	Arrowroot	19.8	0.1	62.2[1]	2.5	339
	Pieser-Livingston Co., Chicago, Ill.:					
1919	Genuine Gluten Flour	41.4	1.4	36.3	9.8	363
	Potter & Wrightington, Boston, Mass..					
1919	Diet-Ease Gluten Flour	39.6	2.3	36.2	11.8	371
	Pure Gluten Food Co., Columbus, Ohio:					
1919	Hoyt's Gluten Flour, over 40 per cent protein	41.8	1.1	33.2	12.1	359
1919	Hoyt's Gluten Self-raising Flour, over 40 per cent protein	41.5	0.9	33.4	9.7	346
1919	Hoyt's Gluten Special Flour, 80 per cent protein	77.2	1.2	2.8	10.6	373
	Schulenburg Oil Mill, Schulenburg, Texas:					
1919	Baumgarten Process Allison Flour	50.0	10.0	1.1	21.6	381
1921	Allison Flour (Cotton Seed)	50.4	7.9	8.8[1]	15.2	369
	Soy Bean Food Products Co., San Francisco, Calif.:					
1919	Soy Bean Flour A	41.8	19.4	0.3	24.1	440
1919	Soy Bean Flour B	44.0	14.2	0.8	26.0	411
	Sprague, Warner & Co., Chicago, Ill.:					
1919	Richelieu Gluten Flour	45.3	1.2	31.6	12.5	368
	Still Rock Spa, Waukesha, Wis.:					
1919	Curdolac Flour	56.6	2.4	5.1	17.9	340
	G. Van Abbott & Sons, London:					
1913–2*p*	Almond Flour	24.6	58.6	None	7.9	657
1913–2*p*	Gluten Flour	68.5	0.9	12.4	6.8	359
1913–2*p*	Gluten Semola	46.9	2.9	28.2	8.7	361
	Waukesha Health Products Co., Waukesha, Wis.:					
1917–2*t*	Ayos, the Improved Soja Bean Flour	41.4	16.9	0.6	24.4	418
1919	Hepco Flour	44.0	19.1	0.9	21.4	438
	White Swan Spice Co., Toronto, Can.:					
1919–4*b*	Diet Flour	8.7	1.3	61.3	16.1	356
1919–4*b*	Gluten Flour	9.8	1.5	62.3	16.0	366
	Wilson Bros., Rochester, N. Y.:					
1919	Genteel Brand Flour	29.4	2.4	49.2	6.2	361

[1] Includes soluble carbohydrate.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	FLOURS AND MEALS—*Continued.*					
1913–2*p*	Gluten Flour, 4/7 Standard	19.0	2.1	54.6	11.8	361
1913–2*p*	Gluten Flour, Self-raising, 4/7 Standard	15.8	2.0	51.8	13.3	342
1919	Gluten Flour	45.8	2.0	28.6	11.9	364
	PROTEIN PREPARATIONS.					
	Cheltine Food Co., Cheltenham, Eng.:					
1922	Milk Protein	84.5	1.0	None	2.4[1]	357
	Norton Truax, Chicago, Ill.:					
1919	Diaprotein	79.4	1.5	None	1.1[1]	336
1922	Diaprotein, No. 2	79.3	1.6	None	1.2[1]	336
	Plasmon Co., London:					
1922	Milk Proteid	75.9	0.7	None	3.1[1]	322
	Menley & James, New York:					
1913–2*p*	Glidine	83.3	0.8	None	9.1	377
	SOFT BREADS.[2]					
	American System of Bakeries, Hartford, Conn.:					
1921	Gluten Bread	26.2	6.0	23.8	6.8	281
1921	Gluten Bread A	27.8	5.9	27.6	6.1	299
1921	Gluten Bread B	28.5	5.4	27.5	5.7	295
	Canada Bread Co., Toronto, Can.:					
1919–4*b*	Gluten Bread	9.9	1.1	34.8	16.5	255
	The Dieto Food Co., New York:					
1914–2*q*	Dieto Bread, Pure Whole Wheat	8.8	0.4	36.6	11.4	231
	Ferguson Bakery, Boston, Mass.:					
1913–2*p*	Gluten Bread	22.1	3.1	25.2	10.5	259
	The Health Food Co., New York:					
1919–2*u*	Glutosac Bread	29.8	2.6	29.5	12.3	309
1919	Protosac Bread, No. 1	36.0	4.0	20.5	7.4	292
1919	Protosac Bread, No. 2	27.0	3.5	30.5	8.4	295
	J. Heinbockel & Co., Baltimore, Md.:					
1914–2*q*	Diabetic Bread for Diabetes	8.6	1.5	40.4	11.7	256
	Jireh Diabetic Food Co., New York:					
1913–2*p*	Whole Wheat Bread (not fresh)	11.3	0.7	44.9	18.2	304
	Levine Bros., New Haven, Conn.:					
1922	Gluten Bread	17.5	3.8	25.7[3]	11.7	254
	Loeb's Diabetic Food Bakery, N. Y.:					
1919	Casein Bread	40.8	10.8	None	3.4	274
1919	Casein Muffins	45.7	11.4	None	7.0	313
1919	Genuine Gluten Bread	28.4	2.1	28.6	6.9	275
1922	Genuine Gluten Bread	32.6	3.6	27.2[3]	4.4	289
1914–2*q*	P & L Genuine Glubetic Bread	35.3	4.1	19.2	10.0	294

[1] Lactose.

[2] It should be remembered that ordinary wheat bread contains protein 9.2, fat 1.3, carbohydrate 52.6 per cent. (See Table ,27 page 172.)

[3] Includes soluble carbohydrate.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate per cent.	
	SOFT BREADS—*Continued.*					
	Lyster Bros., Whitefield, N. H.:					
1915–2*r*	Casein Bread	36.6	18.4	None	2.5	322
	Slinn-Schouldis Co.:					
1919–4*b*	Gluten Bread	9.2	2.6	39.0	13.4	269
	Weston Bakery, Boston, Mass.:					
1915–2*r*	Gluten Bread	19.0	..	28.2	..	..
	HARD BREAD AND BAKERY PRODUCTS.					
	James Aird:					
1916-4*a*	Gluten Bread	13.1	0.7	59.8	15.9	362
	Arnaud, Inc., N. Y.:					
1921	Cassava Cakes	1.8	0.2	69.5	11.1	331
	Brusson Jeune, Villimur, France:					
1921	Gluten Bread	33.8	3.8	45.0	0.4	351
	Callard & Co., London:					
1922	Almond Biscuits, No. 15	34.1	48.6	3.5[1]	2.8	599
1922	Bran and Almond Biscuits, No. 13	24.4	57.5	2.8[1]	3.8	642
1922	Casoid Biscuits, No. 17	58.3	24.6	0.3[1]	1.7	463
1922	Casoid Rusks, No. 8	54.3	26.6	0.5[1]	4.9	478
1922	Gluten and Almond Biscuits, No. 11	65.4	23.3	3.1[1]	None	484
1922	Gluten Biscuits, No. 9	60.4	23.9	3.4[1]	3.9	486
1922	Gluten Cracknells, No. 7	68.7	14.7	3.4[1]	4.7	440
1922	Gluten Dinner Rolls, No. 6	73.8	7.1	5.2[1]	5.4	402
1922	Kalari Batons, No. 5*a*	44.2	42.5	1.2[1]	0.1	568
1922	Parmesan Cheese Straws, No. 17	31.2	48.9	3.5[1]	6.6	606
1922	Ponos Biscuits, No. 14	60.6	19.2	1.3[1]	2.6	431
1922	Prolacto Biscuits, No. 12	59.8	20.5	0.3[1]	4.7	444
1922	Soup Sippets	54.1	28.7	0.5[1]	7.0	505
	Canada Bread Co., Toronto, Can.:					
1916 4*a*	Gluten Health Bread	15.4	3.4	57.9	13.2	376
	Cheltine Food Co., Cheltenham, Eng.:					
1922	Assorted Biscuits	18.3	16.0	51.5[1]	5.3	444
1922	Brown Rusks	18.2	9.7	51.0[1]	10.8	407
1922	White Rusks	22.7	14.8	48.0[1]	4.6	434
1922	Manhu Diabetic Biscuits	12.9	12.0	61.7[1]	5.6	429
	The Dieto Food Co., New York:					
1914–2*q*	Dieto Crackers	13.4	9.2	54.8	13.9	411
1914–2*q*	Dieto Rusks	15.9	9.1	52.1	14.0	410
	Fromm & Co., Dresden:					
1913–2*p*	Almond-form Wafers with Chocolate	4.8	29.0	14.0	48.3	529
1913–2*p*	Butterbrezeln	12.3	16.5	43.1	19.6	449
1914–2*q*	Conglutin Drops	50.8	1.1	29.2	6.9	358
1914–2*q*	Conglutin-Zwieback	14.3	21.3	29.7	27.9	479
1913–2*p*	Crackers	12.9	7.7	58.2	10.2	395
1913–2*p*	Eierbiscuit	18.8	11.4	37.5	23.1	420
1913–2*p*	Haselnuss-Stangen	13.4	16.0	None	60.8	441

[1] Includes soluble carbohydrate.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	HARD BREAD AND BAKERY PRODUCTS—*Continued.*					
1913–2*p*	Luft Bread	50.9	1.0	23.4	7.3	335
1913–2*p*	Makronen	14.1	19.4	None	56.2	456
1913–2*p*	Salt-Stangen	13.0	15.6	39.1	22.1	437
1913–2*p*	Stangenin	14.0	13.0	51.6	12.8	431
1913–2*p*	Uni Bread	71.7	1.7	2.9	6.5	340
	Karl Goldscheider, Karlsbad:					
1914–2*q*	Aleuronat-Conglutin Cakes	26.6	15.6	31.7	19.6	452
1914–2*q*	Butter-Brezeln	10.5	14.9	43.9	23.6	446
1914–2*q*	Feinste Cocosnuss-Biskuits für Diabetiker "3.6 per cent carbohydrates"	34.4	45.4	None	13.9	602
1914–2*q*	Feinste Vanille-Biskuits für Diabetiker, "3.6 per cent carbohydrates"	46.4	30.3	None	16.8	525
1914–2*q*	Honigküchen für Diabetiker, "3.6 per cent carbohydrates"	40.3	38.8	None	13.9	566
1914–2*q*	Saccharin-Oblaten ohne Zucker	16.5	22.6	33.5	17.6	474
1914 2*q*	Tee-Gebäck	7.0	27.3	18.0	42.8	517
1914–2*q*	Zwieback	21.3	3.6	51.7	13.6	379
	Health Food Co., New York:					
1919	Alpha	68.6	8.4	1.0	6.4	380
1919	Alpha No. 1 Best Diabetic Wafer, Casein	48.4	33.5	None	4.9	515
1919	Alpha No. 2 Best Diabetic Wafer	70.5	4.0	1.1	6.3	348
1914–2*q*	Diabetic Biscuit	35.9	8.8	39.8	6.8	409
1919	Gluten Cracker Dust	44.5	8.8	23.2	11.8	398
1919	Gluten Nuggets	28.8	12.3	32.2	15.4	417
1919	Glutona Bread Sticks	33.4	11.1	30.6	14.1	412
1919	Glutosac Butter Wafers	31.1	8.0	40.4	7.9	390
1919	Glutosac Rusk	34.7	5.6	34.3	12.5	376
1919	Glutosac Wafers, Plain	41.0	7.5	25.1	12.1	380
1919	Glutosac Zwieback	28.8	10.5	33.3	15.2	405
1919	No. 1 Proto Puffs	69.1	4.7	3.3	10.7	375
1914–2*q*	No. 2 Proto Puffs	53.6	2.1	20.7	11.5	362
1919	Protosac Rusk	32.7	5.0	39.3	7.8	364
1919	Protosoy Diabetic Wafer	46.5	15.5	10.6	14.2	425
1919	Salvia Almond Sticks	32.1	26.1	21.4	9.1	485
	Heintz Food Co., Chicago, Ill.:					
1913–2*p*	Gluten Biscuits	11.7	18.3	21.4	37.4	447
	Huntley & Palmer, London:					
1916–2*s*	Akoll Biscuits	53.6	28.3	Trace	6.2	493
	Jacob & Co., Dublin, Ireland:					
1922	Plasmon Oat Biscuit	15.4	20.7	49.3[1]	6.1	470
1922	Plasmon Plain Biscuit	18.6	15.8	42.5[1]	3.9	402
1922	Plasmon Sweet Biscuit	17.8	15.2	53.6[1]	4.6	441
1922	Plasmon Wholemeal Biscuit	20.0	16.8	47.2[1]	6.6	446
	Jireh Diabetic Food Co., New York:					
1913–2*p*	Diabetic Biscuit	13.2	7.4	49.6	21.2	403
1913–2*p*	Diabetic Rusks	14.9	8.7	47.0	21.0	410

[1] Includes soluble carbohydrate.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	HARD BREAD AND BAKERY PRODUCTS—*Continued.*					
	Johnson Educator Food Co., Boston, Mass.:					
1913–2*p*	Educator Gluten Bread Sticks	32.7	7.2	37.5	11.5	392
1919–4*b*	Gluten Cookies	20.2	0.3	63.3[1]	6.7	364
	The Kellogg Food Co., Battle Creek, Mich.:					
1913–2*p*	Potato Gluten Biscuit	37.9	0.5	39.5	12.1	363
1919	Pure Gluten Biscuit	78.4	1.5	2.9	6.5	365
1919	40 per cent Gluten Biscuit	40.9	1.6	35 6	10.9	364
	Laporte & Gauthier, Somerset, Manitoba, Can.:					
1921	Croustils, Dechloridized	16.6	6.1	64.8[1]	3.3	394
1921	Croustils, Simple	17.1	3.4	66.0[1]	3.8	378
1921	Croustils, Glutenized	30.3	6.7	49.9[1]	3.3	394
	La Societe l'Aliment "Essentiel," Nanterre, France:					
1921	Heudebert, Bread of Gluten	61.8	6.2	13.2[1]	7.5	386
1921	Heudebert, Aleurone Bread	64.0	5.1	11.5[1]	7.5	378
1921	Heudebert, Special Diabetic Bread	55.5	5.9	19.3[1]	6.6	379
1921	Heudebert, Rolls of Gluten	9.7	8.8	66.1[1]	5.2	403
1921	Heudebert, Rusks of Gluten	10.8	7.6	67.4[1]	5.6	404
	Loeb's Diabetic Food Bakery, N. Y.:					
1919	Aërated Gluten Bread	47.8	11.1	26.8	3.2	411
1922	Aërated Gluten Bread	49.8	12.2	23.6[1]	7.0	431
1919	Diabetic Almond Macaroons	30.4	46.3	0.6	10.5	583
1919	Diabetic Bread Sticks	41.8	3.8	35.4	6.9	371
1919	Diabetic Bread Sticks. Almond	39.4	11.7	31.2	7.1	416
1919	Diabetic Butter Cookies.	36.5	12.0	31.1	8.4	412
1919	Diabetic Lady Fingers	47.8	34.1	1.9	3.5	519
1919	Diabetic Sponge Cookies	49.7	33.8	1.9	1.4	516
1919–2*u*	Gluten Bread	42.5	11.1	27.7	8.8	416
1916–2*s*	Gluten Luft Bread	40.6	9.8	29.9	11.3	415
1919	Gluten Zwieback	38.7	3.0	36.1	10.6	368
1919	Gluten Almond Zwieback	41.3	7.8	32.6	7.0	394
	Pure Gluten Food Co., New York:					
1914–2*q*	No. 1 Dainty Fluffs	79.9	0.5	10.7	0.5	370
1914–2*q*	No. 2 Dainty Fluffs	66.3	0.5	21.9	3.0	369
1916–4*a*	Dainty Fluffs	80.0	0.8	7.7	3.0	370
1914–2*q*	Gum Gluten Biscuit Crisps	48.1	0.5	31.2	11.5	368
	Rademann's Nährmittelfabrik, Frankfurt:					
1913–2*p*	Diabetiker-Biscuit	29.6	19.6	25.9	18.6	473
1913–2*p*	Diabetiker-Bretzel	31.4	8.5	40.7	9.4	402
1913–2*p*	Diabetiker-Cakes	29.6	13.5	39.1	8.1	429
1913–2*p*	Diabetiker-Dessert-Gebäck	22.2	42.4	5.9	21.6	580
1913–2*p*	Diabetiker-Makronen	23.2	48.0	3.0	17.6	607
1913–2*p*	Diabetiker-Stangen	17.7	44.2	21.4	8.1	586
1913–2*p*	Käsestangen	9.3	33.7	38.0	8.4	526

[1] Includes soluble carbohydrate.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	HARD BREAD AND BAKERY PRODUCTS—*Concluded.*					
	R. M. Scott, Ltd., Ipswich:					
1922	Gluten and Almond Biscuit	23.8	19.9	44.5[1]	3.2	465
	James Strachen:					
1916–4*a*	Gluten Bread	16.9	0.6	52.7	21.3	369
	Therapeutic Foods Co., Inc., N. Y.:					
1922	Energen New Natural Gluten Bread	33.1	10.1	44.0[1]	10.2	440
1922	Dr. Charasse Gluten Bread	42.7	5.8	36.0[1]	5.3	388
1922	Dr. Charasse Gluto-Kola Bread	45.9	6.0	37.3[1]	None	387
1922	Dr. Charasse Gluto-Soja Bread	48.6	6.9	33.3[1]	0.7	393
1922	Dr. Charasse Supreme Bread	45.6	6.9	35.9[1]	0.6	391
	G. Van Abbott & Sons, London:					
1913–2*p*	Caraway Biscuits for Diabetics	35.6	37.5	8.6	7.3	544
1913–2*p*	Diabetic Rusks for Diabetics	70.9	0.8	12.6	3.4	355
1913–2*p*	Euthenia Biscuit	35.8	40.7	6.9	6.3	562
1913–2*p*	Gluten Biscottes or Rolls	47.1	2.3	29.8	7.7	359
1913–2*p*	Gluten Bread or Slices	49.4	2.2	27.4	8.2	361
1913–2*p*	Gluten Butter Biscuit for Diabetics	40.2	33.2	9.0	7.6	526
1913–2*p*	Ginger Biscuit for Diabetics	34.6	39.4	10.9	5.8	560
1913–2*p*	Midolia Biscuit	17.6	36.4	13.4	18.2	524
1922	Soya Biscuit	39.2	25.0	11.4[1]	11.8	475
1913–2*p*	Walnut Biscuits for Diabetics	20.9	57.2	Trace	12.3	648
	Waukesha Health Products Co., Waukesha, Wis.:					
1919	Hepco Dodgers	42.4	16.7	1.0	21.6	411
	Weston's Bakery, Boston, Mass.:					
1915–2*r*	Gluten Cookies	27.7	..	19.6	..	..
	Woman's Baking Co., Boston, Mass.:[2]					
1921	Bran Cookies, Anice	7.4	25.9	5.2[1]	..	..
1921	Bran Cookies, Caraway	8.1	24.2	5.0[1]	..	..
1921	Bran Cookies, Cocoa Nib	8.2	26.9	8.7[1]	..	..
1921	Bran Cookies, Spice	6.6	22.7	9.3[1]	..	..
1921	Bran Muffins	7.3	5.9	5.6[1]	..	..
1921	Cellu Biscuits	3.2	13.2	3.9[1]	..	..
1921	Cellu Cookies, Caraway	5.6	22.5	3.8[1]	32.0	..
1921	Cellu Cookies, Lemon	4.2	24.4	3.9[1]	..	..
1921	Cellu Cookies, Vanilla	4.3	21.3	4.1[1]	..	..
1921	Cellu Kisses	23.0	0.2	2.5[1]	25.2	..
1921	Cellu Muffins	3.8	13.6	3.5[1]	..	..
1921	Cellu Nuts	5.4	28.7	3.6[1]	23.8	..
1921	Cellu Soup Wafers	3.7	25.6	4.2[1]	..	..
	BREAKFAST FOODS.					
	Arnaud Inc., New York:					
1921	Starchless Breakfast Food	2.0	0.2	70.9[1]	10.3	335

[1] Includes soluble carbohydrate.

[2] The fat in these products is largely or entirely mineral oil and unassimilable.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	BREAKFAST FOODS—*Concluded.*					
	Brusson Jeune, Villimur, France:					
1913–2*p*	Farina au Gluten	30.9	0.6	48.8	8.0	356
	Dieto Food Co., New York:					
1914–2*q*	Dieto Nut Cereal	21.6	18.4	39.5	12.3	459
1914–2*q*	Wheat and Barley Cereal	11.6	2.2	61.4	14.4	369
	Farwell & Rhines, Watertown, N. Y.:					
1913–2*p*	Barley Crystals	11.5	1.3	62.7	12.5	359
1913–2*q*	Cresco Grits	17.8	1.4	54.1	14.5	358
	Health Food Co., New York:					
1919	Manana Gluten Breakfast Food	44.8	8.7	22.0	12.5	396
1919	Protosoy (Cereal)	40.1	18.2	Trace	24.9	424
	Jireh Diabetic Food Co., New York:					
1913–2*p*	Whole Wheat Farina	11.7	2.3	59.5	16.3	371
1913–2*p*	Frumenty	12.3	1.7	65.4	11.9	374
	Loeb's Diabetic Food Bakery, N. Y.:					
1919	Casein Breakfast Cereal	36.6	42.5	0.7	11.0[1]	576
1919	Gluten Breakfast Cereal	29.2	19.4	25.5	17.8	464
	Plasmon Co., London:					
1922	Oats	17.3	8.1	57.4[2]	5.9	395
	Pure Gluten Food Co., N. Y.:					
1919–4*b*	Gluten Breakfast Food	40.8	0.7	35.7	12.3	361
1916–4*a*	Gum Gluten Granules	39.3	0.9	40.5	11.4	373
1919	Hoyt's Gluten Breakfast Food, 40 per cent protein	46.0	1.8	31.4	10.2	366
1919	Hoyt's Gluten Granules, over 40 per cent protein	43.8	2.6	32.2	10.1	368
1923	Hoyt's Gluten Flakes	44.7	4.4	16.5[2]	18.9	360
	Waukesha Health Products Co., Waukesha, Wis.:					
1919	Hepco Grits	40.3	16.4	0.9	23.9	408
	MACARONI, NOODLES, ETC.					
	Brusson Jeune, Villimur, France:					
1913–2*p*	Petites Pâtes au Gluten	17.0	1.0	61.2	10.8	365
	Callard & Co., London:					
1922	Casoid Flakes	78.5	3.1	1.2[2]	None	347
1922	Casoid Vermicelli	80.0	2.7	0.5[2]	None	346
	The Dieto Food Co., New York:					
1914–2*q*	Whole Wheat Brand Macaroni	13.9	1.1	58.7	15.0	361
	Jireh Diabetic Food Co., New York:					
1913–2*p*	Macaroni	16.9	0.9	58.8	12.6	361
	Eugene Loeb, New York:					
1913–2*p*	Home Made Noodles	41.8	5.5	36.7	5.0	384
	Loeb's Diabetic Food Bakery, N. Y.:					
1919	Gluten Noodles	37.3	3.6	36.8	10.3	370
	Pure Gluten Food Co., New York:					
1914–2*q*	Hoyt's Gum Gluten Noodles	36.9	1.2	41.8	10.8	369

[1] Includes fiber.

[2] Includes soluble carbohydrate.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—*(Continued.)*

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	NUTS AND NUT PREPARATIONS.					
	Dieto Food Co., New York:					
1914–2*q*	Pine Nuts	39.7	50.0	None	2.8	620
	Chas. Lawrence Co., Boston, Mass.:					
1913–2*p*	California Paper Shell Almonds, edible portion	18.4	55.3	None	16.3	637
	Christian National Food Co., Kenilworth, N. J.:					
1916–2*s*	Christian's Protoid Nuts	37.6	48.2	Trace	5.7[1]	607
	Jireh Diabetic Food Co., New York:					
1913–2*p*	Diabetic Pine Nuts (Pignolias)	39.7	49.4	None	3.4	617
	The Kellogg Food Co., Battle Creek, Mich.:					
1913–2*p*	Nut Bromose (Meltose and Nuts)	17.1	26.8	3.2	36.2	467
1913–2*p*	Pine Nuts	38.0	49.6	4.2		615
	Nashville Sanitarium Food Co., Nashville, Tenn.:					
1913–2*p*	Malted Nut Food	24.7	42.7	3.4	24.1[1]	593
1913–2*p*	Nut Butter	28.0	52.6	3.8	9.2	637
1913–2*p*	Nutcysa	12.9	21.0	Trace	6.3	266
1913–2*p*	Nutfoda	20.8	8.0	Trace	6.8	182
	CHOCOLATE AND CHOCOLATE PREPARATIONS.					
	Brusson, Jeune, Villimur, France:					
1913–2*p*	Chocolate with added Gluten a la Vanille	15.9	49.7	9.2	17.2	617
	Callard & Co., London:					
1922	"Casoid" Chocolates	22.9	38.8	5.0	23.0	553
1922	"Casoid" Dessert Chocolate	24.9	46.1	7.9	11.3	591
1922	"Casoid" Nut Chocolate	23.9	46.4	8.6	11.3	593
1922	Chocolate Biscuits	26.1	49.8	5.6	9.2	612
1922	Sugarless Chocolate	14.0	44.3	14.0	17.3	580
	Fromm & Co., Dresden:					
1913–2*p*	Conglutin-Diabetiker-Schokolade	17.6	39.1	4.3	28.4	553
	Karl Goldscheider, Karlsbad:					
1914–2*q*	Feinste Dessert-Schokolade für Diabetiker, "9.98 per cent carbohydrates"	11.4	57.6	5.0	20.4	665
1914–2*q*	Feinste Mocca-Schokolade für Diabetiker, "10.26 per cent carbohydrates"	10.2	60.2	4.1	19.4	677
1914–2*q*	Feinste Nuss-Schokolade für Diabetiker, "11.32 per cent carbohydrates"	14.6	54.4	6.9	16.4	641

[1] Includes fiber.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	CHOCOLATE AND CHOCOLATE PREPARATIONS—*Concluded.*					
1914–2*q*	Feinste Orange-Schokolade für Diabetiker, "9.98 per cent carbohydrates"	11.4	57.6	5.0	19.9	664
	Loeb's Diabetic Food Bakery, N. Y.:					
1919	Almond Chocolate Bars	14.9	53.2	5.3	15.6	622
1919	Diabetic Chocolate	14.7	51.7	7.3	15.5	615
	Plasmon Co., London:					
1922	Plasmon Chocolate	13.8	29.4	38.5[1]	14.4	531
	Rademan's Nährmittelfabrik, Frankfurt:					
1913–2*p*	Diabetiker-Chokolade	17.5	57.6	3.8	13.1	656
	COCOA.					
	Callard & Co., London:					
1922	Biogene Cocoa	33.1	17.9	11.1[1]	19.8	417
	Cheltine Food Co., Cheltenham, Eng.:					
1922	Cheltine Milk-Cocoa	47.1	15.9	8.9[1]	13.1	420
	The Dieto Food Co., New York:					
1914–2*q*	Dieto Cocoa	23.6	22.9	12.4	26.6	456
	Loeb's Diabetic Food Bakery, N. Y.:					
1922	Diabetic Cocoa	25.4	20.9	16.0[1]	23.1	446
	Gustav Müller, New York:					
1913–2*q*	Charrasse Gluto-Cacao	21.5	22.2	16.3	23.8	466
	Plasmon Co., London:					
1922	Cocoa	50.4	11.6	6.0[1]	13.1	382
	Rademan's Nährmittelfabrik, Frankfurt:					
1913	Diabetiker-Cacao	17.6	23.6	10.7	34.0	462
	SUGAR-FREE MILK.					
	Gustav Müller & Co., New York:					
1913–2*p*	Dr. Bouma Sugar-free Milk	2.4	5.3	..	..	57
	D. Whiting & Sons, Boston, Mass.:					
1919	Sugar-free Milk	6.4	9.3	..	0.2[2]	110
	FRUITS AND VEGETABLES—(CANNED).					
	The Diaprotein Co., Columbus, Ohio: "Dieta" Brand Products:					
1921	Apple Sauce	0.2	0.6	5.8[1]	3.7	44
1921	Blackberries	0.7	0.5	2.6[1]	2.4	27
1921	Cherries, Red, Pitted	0.5	0.1	5.1[1]	3.4	37
1921	White	0.7	0.1	3.8[1]	3.5	33
1921	Peaches, Yellow	0.5	0.1	2.9[1]	2.5	25
1921	Pears, Bartlett	0.3	0.1	2.5[1]	2.7	23
1921	Raspberries, Red	0.9	0.7	3.0[1]	4.0	38
1921	Strawberries	0.6	0.4	2.0[1]	2.4	24
1921	Beans, Cut, Wax	0.8	0.1	1.2[1]	0.5	11
1921	Refugee, Green	1.0	0.1	1.4[1]	0.8	14
1921	Peas, Green	3.2	0.4	3.9[1]	2.2	41
1921	Rhubarb	0.4	0.1	0.3[1]	1.9	11

[1] Includes soluble carbohydrate.
[2] Lactose.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—(*Continued.*)

Reference.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
				Starch, per cent.	Other carbohydrate, per cent.	
	FRUITS AND VEGETABLES.—(CANNED.)—*Concluded.*					
1921	Spinach	3.1	0.6	0.6[1]	1.0	24
1921	Tomatoes	1.0	0.2	1.5[1]	1.3	17
	The Poms Co., Sarasota, Fla.					
1924	Grapefruit (Poms)	0.5	0.1	4.2[1]	4.1	36
	MISCELLANEOUS PRODUCTS.					
	The Dieto Food Co., New York:					
1914–2*q*	Dieto Baking Powder	..	..	12.9	..	..
1914–2*q*	Dieto Barley Coffee	13.2	7.3	17.7	46.2	374
	Manual Freres:					
1917–2*t*	Longuets de Lausanne	14.2	5.5	49.2	16.9	371
	Health Food Co., New York:					
1913–2*p*	Kaffeebrod	12.9	1.5	10.1	62.4	355
	Genevieve Jackson, Los Angeles, Calif.:					
1919	Dia-Biskit	17.6	4.8	6.1[2]	47.2	328
	Jell-O Company, Le Roy, N. Y.:					
1924	D-Zerta[3]	72.8[4]	0.1	None[1]	..	..
	Low-nutritive Fillers:					
1919	Cellu Flour (Dietetic Cellulose Co., Chicago)	None	Trace	None	36.9[5]	..
1922	Cellulose Flour (from Corn cob)	1.0	0.5	0.3	28.8[5]	.
1924	Low Caloric Flour (Lister Bros., Inc., New York)	3.9	0.6	None	76.6[5]	..
1924	Nutrivoid Flour (Nutrivoid Diabetic Flour Co., Brooklyn, N. Y.)	4.3	0.9	None	78.2[5]	.

[1] Includes soluble carbohydrate.

[2] Includes reducing material derived from agar-agar.

[3] Ash, 1.7 per cent; undetermined (chiefly water and organic acids), 25.4 per cent.

[4] Gelatin (N. × 5.55).

[5] Probably largely unavailable.

TABLE 28.—COMPOSITION OF SO-CALLED DIABETIC FOODS, ETC.—*(Concluded.)*

Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
			Starch, per cent.	Other carbohydrate, per cent.	
BRAN PRODUCTS.					
Bran Products and Other Laxative Preparations:					
Bran, washed (Woman's Baking Co.)	11.2	7.4	4.6[1]	....	....
Bran (so-called "health bran" for dietetic use), average of six commercial brands	15.6	4.8	55.8		329
Bran Biskue	12.1	13.1	61.0		410
Bran Zos	13.2	2.5	65.6		338
Bran-eata Biscuit	9.1	0.9	72.2		333
Brose Good Health Breakfast Food	14.4	4.3	65.5		358
Cerag	11.3	0.9	73.0		345
Christian's Laxative Bread	10.0	1.4	74.6		351
Colax	1.1	0.8	82.8		343
Dietetic Bran Biscuit	9.9	5.0	69.1		361
Educator Bran Cookies	8.9	14.5	64.7		425
Educator Bran Meal	12.3	2.8	66.4		340
F.B.A. Health Biscuit	6.1	1.7	77.3		349
Fruit Nut Cereal	13.5	1.2	72.4		354
Good Health Biscuit (Kellogg)	7.7	1.2	74.5		340
Health Food Wafers	10.0	7.9	65.7		374
India (Digestive) Biscuit	12.8	2.2	66 1		335
Laxa	12.4	2 8	66 6		341
Laxative Biscuits (Kellogg)	16.7	10 8	57.7		395
Mansfield's Agar-Agar Wafers	7.1	12.0	69.9[2]		416
Oval Digestive Biscuit (H and P)	7.8	16.3	64.5		436
Uncle Sam Health Food	21.3	24.4	40.9		468
Zim	7.4	1.7	74 2		342

[1] Includes soluble carbohydrate.
[2] Carbohydrate of agar-agar largely unavailable.

CHAPTER XX.

SELECTED LABORATORY TESTS USEFUL IN DIABETIC TREATMENT.

An early diagnosis in diabetes is as important as in tuberculosis and is far more easily made. The disease usually begins insidiously and its prompt detection depends upon the routine examination of the urine of everybody rather than upon the examination of the urine of patients who present symptoms of the disease. General practitioners should teach their patients, as a matter of routine, to have their own urines and the urines of the members of their families examined each birthday. Each diabetic should protect his father, mother, brother and sister by making a yearly examination of the urine and a semi-annual examination, if the relative is over fifty years of age. Every boy and girl who studies chemistry should be taught the Benedict test.

EXAMINATION OF THE URINE.

Examination of the urine should cost the patient little. Formerly many deprecated the routine examinations made in drug stores, but the value of such examination is now recognized. The druggist is a trained chemist. He is constantly doing quantitative work, and it is far easier and cheaper for him to examine a urine than for a doctor. Druggists will undoubtedly undertake such work with satisfaction. It will be an agreeable relief from many of the activities of a drug store which have nothing to do with the profession of a pharmacologist.

The examination of the urine of the diabetic patient is usually a simple matter. It comprises a statement indicating the volume in twenty-four hours, specific gravity, reaction,

presence or absence of albumin, sugar and diacetic acid. Frequently the ammonia, salt (sodium chloride), acetone, diacetic acid, and nitrogen are determined and the urinary sediment submitted to microscopical study.

Although diabetic patients can test their own urines for sugar, and almost invariably are warranted in relying upon the result of their examination, they should not feel that they are expert analysts. More than once patients have arrived at erroneous conclusions, in part due to the preparation of chemical reagents employed. It is therefore safer for all diabetic patients to send their urines once a month to their physician. If the urine is free from sugar, such an examination can be made by a physician within fifteen minutes. A microscopical examination or a quantitative examination for sugar demands half an hour more or less.

The Collection of Urine.—To collect the twenty-four hour quantity of urine, discard that voided at 7 A.M. and then save in a cool place all urine passed thereafter up to and including that obtained at 7 A.M. the next morning.

It has become increasingly important since the advent of insulin to examine separately the urine voided after meals and during the night. By a study of the morning, afternoon, evening and night specimens one can determine whether less carbohydrate or more insulin is indicated at any one of these four periods of the twenty-four hours.

Reaction.—The normal urine is acid. Urine voided after a meal rich in vegetables and fruits is frequently alkaline, due to the alkaline salts which they contain. Therefore the report that the urine is acid does not imply in the slightest degree that a patient has acid poisoning.

Specific Gravity.—The specific gravity of the urine will be best understood if it is recalled that the specific gravity of water is 1000. Urine is heavier than water and normal urine has a specific gravity, on account of the solids contained in it, of about 1015 to 1020. Normal urine if concentrated would have a higher specific gravity, and if dilute it would be lower. The specific gravity of the urine in diabetes varies chiefly with the percentage of sugar which it contains. It frequently is above 1020 and may be above 1040, but sugar may be

present in the urine when the specific gravity is as low as 1007.

Albumin.—Two tests are usually employed, the one in confirmation of the other.

1. *Nitric Acid Test.*—To 5 cc of filtered urine add one-third the quantity of nitric acid by pouring it down the side of the glass so that it underlies the urine. A white precipitate forms in the urine at the junction of the two fluids. A precipitate higher in the urine may be due to urates. Bile or urinary coloring matters may give a color to the urine or precipitate at the junction of the fluids.

2. *Heat Test.*—Pour 10 cc of filtered urine into a test-tube and boil the upper half of the fluid. Add 5 drops of 10 per cent acetic acid and boil again. A precipitate appearing on boiling which persists after the addition of the acid, or appearing on the second boiling, is albumin; one disappearing with the acid is due to phosphates. The test may fail with an excess of acid.

Sugar.—Sugar is not disclosed in the urine of normal individuals and of carefully treated diabetics by the routine tests. It can be demonstrated readily if it amounts to as little as 0.05 per cent, and it may rise to as high as 9 or 10 per cent when the diabetic diet is not followed. Most untreated cases show between 2 and 6 per cent of sugar. The total quantity of sugar in the urine in the twenty-four hours is easily estimated by multiplying the percentage of sugar which the urine contains by the total amount of urine voided. Thus, if the total quantity of urine is 3000 cc, 1 quart equals 946 cc, and the percentage of sugar is 4 per cent, the amount of sugar in the urine would be (3000×0.04) 120 grams, that is, about 4 ounces or $\frac{1}{4}$ of a pound. It is not very often that one finds more than 1 pound of sugar excreted in the urine during twenty-four hours. The food value of the sugar lost, if only 120 grams, is considerable. Each gram of sugar is the equivalent of 4 calories, and 120 grams would amount to 480 calories in a day. This is approximately one-fourth of the total food value required by an individual, with a quiet occupation who weighs 60 kg. (132 pounds). Thus, it is evident, that 4 untreated diabetics, even though the

disease is of very moderate severity, provided they eat enough to make up the loss, will waste in a day enough food to supply the needs of a normal individual of equal weight for the same space of time.

The Benedict Test for Sugar.—Many tests for sugar in the urine are employed. The Benedict test[1] is one of the best. As used with urine, the test is sufficiently delicate to detect quantities as small as 0.08 or 0.1 per cent sugar. The Benedict solution employed has the advantage of not decomposing, even after months.

Seven cubic centimeters (an ordinary teaspoon holds about 5 cc) of Benedict's solution are placed in a test-tube. Eight (not more) drops of the urine to be examined are added, the tube is agitated to mix the urine and the solution and then placed in bubbling water, where it must remain with the water actually boiling for five minutes. It is then removed. If the solution remains clear, the urine being tested is sugar-free; if one can read print through the solution the percentage of sugar is so slight that it can be disregarded; if a heavy greenish precipitate forms, it usually means there is a trace of sugar; the appearance of a yellow sediment indicates the presence of a few tenths per cent of sugar in the urine, and a red sediment more. The entire amount of copper in the 7 cc of solution is reduced (as determined by allowing the test to stand and observing a water clear supernatant fluid) by a urine of approximately 1.5 per cent glucose content.

Upon removal from the boiling water shake the test-tube. The discoloration which occasionally forms upon the surface is unimportant and with shaking disappears.

The chief points to be remembered in the use of the Benedict reagent are: (1) The addition of not more or less than 8 drops of urine, delivered from an unbroken medicine dropper; (2) the use of not less than 5 cc or more than 8 cc of Benedict's solution; (3) the transfer of the tube to water, actually boiling, where it should remain for five minutes; (4) the change in color and transparency of the solution is the criterion for a positive test for sugar.

[1] Benedict, S. R.: Jour. Am. Med. Assn., 1911, **57**, 1193.

The formula and directions for preparing the Benedict solution follow: They should be strictly adhered to in preparing the solution.

	Grams or cc.
Copper sulphate (pure crystallized)	17.3
Sodium or potassium citrate	173.0
Sodium carbonate[1] (anhydrous)	100.0
Distilled water to make	1000.0

The citrate and carbonate are dissolved together (with the aid of heat) in about 700 cc of water. The mixture is then poured (through a filter if necessary), into a larger beaker or casserole. The copper sulphate (which should be dissolved separately in about 100 cc of water) is then poured slowly into the first solution, with constant stirring. The mixture is then cooled and diluted to 1 liter. This solution keeps indefinitely.

Quantitative Tests.—It is one of the chief advantages of modern treatment that the need for these tests is nearly abolished. The simplification of the treatment of diabetes means everything to the practitioner and patient. At the beginning of treatment, however, it is desirable to follow the reduction of sugar excreted along with changes of the diet and the determination of the percentage of sugar in the urine is indicated. Two quantitative tests will be described and for these modifications of the original quantitative Benedict test I am indebted to Dr. Millard Smith.

(1.) *Simplified Benedict Test.*—The Benedict's quantitative solution, as modified by Smith for use exclusively with his 5-cc method, is as follows:

Pure crystallized copper sulphate	14.20 gm.
Anhydrous sodium carbonate	100.00 "
Sodium citrate ($5\frac{1}{2}$ H_2O)	200.00 "
Potassium sulphocyanide	125.00 "
5 per cent potassium ferrocyanide	10.00 cc
Distilled water to make a total volume of	1000.00 "

"With the aid of heat dissolve the carbonate, citrate and potassium sulphocyanide in enough water to make about

[1] The crystallized (10 molecules of water) Na_2CO_3 is more soluble; 270 gm. of the crystals are equivalent to 100 gm. of the anhydrous salt.

800 cc of the mixture. Dissolve the copper sulphate (which has been accurately weighed) separately in about 100 cc of water and pour the solution into the other liquid with con-

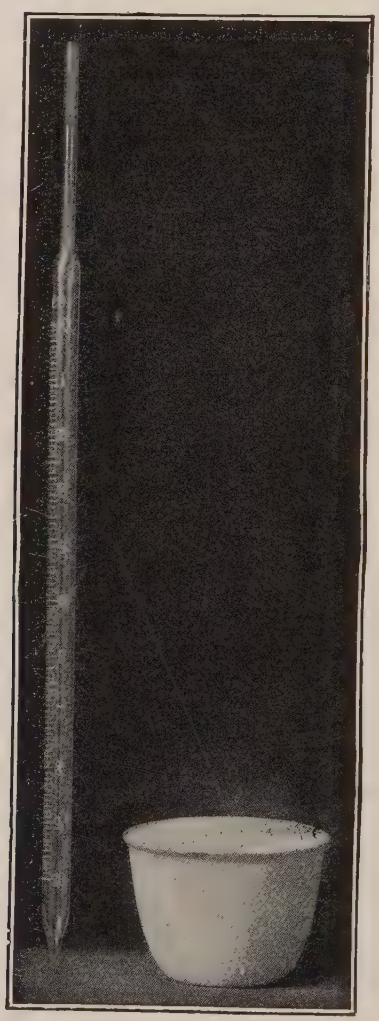


FIG. 17.—Apparatus required for a simplified, quantitative Benedict test.

stant stirring. Add the ferrocyanide solution, cool and dilute to exactly 1 liter. Only the copper sulphate need be weighed with exactness." The sodium citrate should contain $5\frac{1}{2}$ molecules of water and the sodium carbonate should be anhydrous. If it is necessary to use either with a different amount of water content, the weight should be corrected accordingly. The copper sulphate crystals should be pure blue and any white deposit of the anhydrous salt should be removed before weighing.

Five cubic centimeters of this reagent are reduced by 10 mg. of glucose when used under the exact conditions to be described.

Articles Required.

Ten cubic centimeters Mohr pipette graduated in tenths of a cubic centimeter; small white enamelware dish, 3 inches across and 2 inches deep; talcum powder; anhydrous sodium carbonate; water and flame.

The test can be performed by the aid of a kitchen gas burner or small alcohol stove. If the gas burner is not a small one and flares around the edges of the dish, put an asbestos plate or simply an iron cover over it.

The Determination.

1. Place 5 cc of the quantitative copper solution, accurately measured, in the dish.
2. Add 20 cc of water. Measure this with the Mohr pipette as the total dilution of copper solution should be quite accurate.
3. Add about half a thimble-full of talcum powder.
4. Add 10 grams of anhydrous sodium carbonate. It is important to have this much carbonate. It may be weighed with sufficient accuracy by means of the food scales.
5. Dilute 1 part of urine with 9 parts of water unless the quantity of sugar is low. (A low percentage of sugar is shown by the qualitative Benedict test turning green instead of brown. With small quantities of sugar it is not necessary to dilute the urine.)

6. Bring the contents of the dish to boiling, maintain in this condition and then add, drop by drop, the urine from the graduated Mohr pipette until the blue color has entirely disappeared. Upon the first trial too much may be added, and therefore having noted the approximate quantity of urine required to reach the end-point, invariably repeat the test as a control. It is important that the total volume of the boiling solution should not decrease or increase (within reasonable limits *i. e.*, 5 to 8 cc) and this should be controlled by either vigorous boiling or the addition of water according as to which may be necessary.

Calculation.

Five cubic centimeters of the copper solution are reduced by 0.01 grams of glucose. Consequently, the quantity of undiluted urine required to reduce the 5 cc of copper solution contains 0.01 grams of glucose.

$$\frac{0.01}{x} \times 100 = \text{per cent glucose in the urine.}$$

x = cc of undiluted urine used in titration.

Example.—Fifteen hundred cubic centimeters urine in twenty-four hours. Five cubic contimeters used to reduce (decolorize) Benedict solution.

$$\frac{0.01}{0.5} \times 100 = 0.2 \text{ per cent}$$

1500 × 0.002 (0.2 per cent) = 3 grams sugar in twenty-four hours.

Example.—If the urine had been diluted with 9 parts water, in other words, 10 times, the calculation would be:

$$\frac{0.01}{5} \times 100 = 2 \text{ per cent}$$

1500 × 0.02 (2 per cent) = 30 grams sugar in twenty-four hours.

(2) *A Micro-modification of Benedict's Test.*—For this test Millard Smith[1] uses even less solution than the 5-cc modifi-

[1] Smith: Jour. Lab. and Clin. Med., 1922, **7**, 3.

cation and thus there is the advantage of using the original quantitative copper solution of Benedict unchanged. The test is performed in a minimum of time and the end-point is more distinct than in either the original method or the 5-cc modification. It is not necessary to calculate the final percentage of sugar for this can be read directly on the special pipette used for titrating.

Apparatus Needed.

A small ring stand with test-tube clamp.

Micro-Bunsen burner or small alcohol lamp.

Titration-tube as shown in Fig. 18. (A test-tube of same size without the bulb may be used.)

One large bore Mohr pipette graduated to read directly in percentages of sugar.

The titration-tubes and the pipette may be obtained from the Emil Greiner Company, 55 Fulton Street, New New York City, who have prepared an outfit suitable for a doctor to carry in his bag.

One 1-cc Ostwald pipette.

FIG. 18.—Titration-tube for micro-modification of Benedict test.

Determination.

"Accurately pipette 1 cc of Benedict's solution into a test-tube and then add 0.2 to 0.7 gram of anhydrous sodium

carbonate. A small well dried pebble, or piece of quartz, or a pinch of talcum powder should also be added to prevent bumping.

"Heat the mixture to boiling and add the urine from the Mohr pipette until reduction is complete as evidenced by the disappearance of the blue color. The approximate strength of the urine, with a slight amount of experience, is easily estimated from the qualitative Benedict test. Urines over 3 per cent should be diluted to contain 1 per cent or less of sugar to secure an accurate titration.

"For *rapid* reduction of the reagent, vigorous boiling is essential, which may result in too rapid evaporation. This is avoided by allowing more time for reduction between additions of urine.

"The best results are obtained if the solution is kept *at* the boiling point by manipulation of the flame and the urine added slowly. A very small flame should be employed. *The tendency in this titration of sugar is to go past the end-point. This is because the reduction does not take place as rapidly as the ordinary titrations to which one is accustomed. When nearing the end-point the urine must be added slowly.* In urines of low sugar content the boiling should be rather vigorous at first in order to maintain a constant volume while the 1 to 2 cc of urine necessary to give complete reduction are being added. With a moderate amount of practice the regulation of the volume of the boiling solution becomes quite simple."

Methods for the Determination of the Urinary Acids.—Qualitative Tests.—*Diacetic Acid* (CH_3COCH_2COOH).—The simplest method for the detection of acidosis by urinary examination is Gerhardt's ferric chloride reaction for diacetic acid. The test may be performed as follows: To about 10 cc of the fresh urine carefully add a few drops of an undiluted aqueous solution of ferric chloride, Liquor Ferri Chloridi, U. S. P. A precipitate of ferric phosphate first forms, but upon the addition of a few more drops is dissolved. The depth of the Burgundy red color obtained is an index to the quantity of diacetic acid present. I record the intensity of the reaction as follows: +, ++, +++ or ++++.

Confusion as to the significance of the test arises if the patient is taking sodium salicylate, aspirin or allied products. This is to a considerable extent avoided by vigorously boiling the urine after the addition of the ferric chloride, when the deep color markedly decreases or disappears if caused by diacetic acid, but remains the same if caused by the above drugs.

Acetone (CH_3COCH_3).—The different tests for acetone are in reality tests for diacetic acid. Legal's test is as follows: A few crystals of sodium nitroprusside are dissolved in 5 cc of urine, which is then rendered alkaline with sodium hydrate. Shake vigorously. Two drops of glacial acetic acid are then allowed to run down the side of the test-tube and a distinct purple color appears, which is best seen in the foam.

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